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THE PHILOSOPHICAL REVIEW

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I. On Keynes' Theory of Probability ..... THEODORE DE LAGUNA
II. Science, Philosophy, and Certainty ..... W. H. SHELDON
III. The Psychological Point of View ..... JOHN BAILLIE
IV. Causation and the Geometric Method in the Philosophy of Spinoza (II) ..... RICHARD MCKEON
V. REVIEWS OF BOOKS.
Maurice Pradines, Le problème de la sensation: by G. S. Brett—*Edmund Husserl*, Formale und transzendentale Logik: by William Curtis Swabey—*W. D. Ross* (ed.), The Works of Aristotle translated into English, Vol. 1: by Richard Robinson—*D. W. Prall*, Æsthetic Judgment: by C. J. Ducasse—*John H. Muirhead*, The Use of Philosophy: by L. P. Chambers—*Alexander Coates*, A Sceptical Examination of Contemporary British Philosophy: by G. Watts Cunningham—*Salvador de Madariaga*, Englishmen, Frenchmen, Spaniards: by T. V. Smith.
VI. NOTES.

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THE PHILOSOPHICAL REVIEW

Contents for May, 1930

On Keynes' Theory of Probability ..... THEODORE DE LAGUNA 227

Science, Philosophy, and Certainty ..... W. H. SHELDON 243

The Psychological Point of View ..... JOHN BAILLIE 258

Causation and the Geometric Method in the Philosophy of Spinoza (II) RICHARD MCKEON 275

Reviews of Books 297

Maurice Pradines, Le problème de la sensation: by G. S. Brett—*Edmund Husserl*, Formale und transzendentale Logik: by William Curtis Swabey—*W. D. Ross* (ed.), The Works of Aristotle translated into English, Vol. 1: by Richard Robinson—*D. W. Prall*, Æsthetic Judgment: by C. J. Ducasse—*John H. Muirhead*, The Use of Philosophy: by L. P. Chambers—*Adrian Coates*, A Sceptical Examination of Contemporary British Philosophy: by G. Watts Cunningham—*Salvador de Madariaga*, Englishmen, Frenchmen, Spaniards: by T. V. Smith.

Notes 323

Mary Whiton Calkins. Christine Ladd-Franklin. The Earl of Balfour. Harold R. Chidsey. Ralph M. Blake. Lectureship in honor of William James. *Encyclopaedia of the Social Sciences*. Current philosophical periodicals.

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THE PHILOSOPHICAL REVIEW.

ON KEYNES' THEORY OF PROBABILITY.

A PRONOUNCED character has been given to the logical speculation of recent years, and especially to the form taken by the systems of symbolic logic, by the theory of the primacy of the logic of propositions—the logic that treats of such inferences as this: '*p* implies *q*, and *q* implies *r*, therefore *p* implies *r*', where *p*, *q*, and *r* are propositions. In the earliest organization of the science in ancient times, only the logic of properties and classes was recognized, as represented by the categorical syllogism, such as: 'Every *M* is a *P*, every *S* is an *M*, therefore every *S* is a *P*'. Later the hypothetical syllogism, a form belonging to the logic of propositions, was added to the categorical syllogism; and in our elementary textbooks it still has the place of an appendix loosely joined to the Aristotelian body of doctrine. It is this appendix that recent theory has expanded and glorified, and has made to be the very root and trunk of the system of logic.

There are grounds for believing that this has been a serious mistake, and that the logic of propositions has in truth only a very slight and secondary importance. It treats of propositions as simple units, such as might properly be represented by single letters, *p*, *q*, and *r*, without looking into their contents. But in scientific reasoning the contents of the propositions are always essential; and in general statements we always affirm or deny the implication of one property (*i.e.*, of one quality or relation) by another, which is by no means the same thing as the implication of one proposition by another. This holds even of the logic of propositions

itself. It may well be questioned whether there is not good reason for us to return in this matter to the Aristotelian tradition, and to test more thoroughly its capacity for yielding the varied developments which have recently been obtained in other ways.

However, I do not propose to argue the question here. I raise it because it must be kept in view if there is to be a correct appreciation of the significance of the work of Mr. Keynes in the theory of probabilities. For that work is dominated by the conception—due presumably to the influence of Mr. Bertrand Russell—that logic is primarily a science of the relations between propositions as such; and the influence of this way of thinking has been most unfortunate. Probability is a field in which the contents of the propositions involved cannot be safely ignored. Treating the propositions as units to be denoted by single letters may illuminate some aspects of the matter, but it inevitably obscures others. The consequence, as it appears to me, is that Mr. Keynes' views, while often penetrating, are always narrow. He is unable to do justice to the work of his predecessors, especially among the mathematicians; and at critical points his own theory exhibits a fatal weakness.

This is what I shall endeavor to show in the following pages, and I hope that the argument will have a value in two directions: first, in bringing into a clearer light certain aspects of the theory of probabilities; and secondly, in illustrating the general limitations of the logic of propositions. The illustration is not indeed a perfect one. Mr. Keynes' logic is by no means adequately characterized by calling it a logic of propositions. An important fact is that in so far as he deals with the implication of one proposition by another it is 'strict' implication that he has in view,—the deducibility of the consequent from the antecedent. Furthermore, there is an element of subjectivism in his thought, which is not necessarily connected with any type of formal logic, and which is wholly foreign to Mr. Russell.

Mr. Keynes' fundamental doctrine, upon which the whole work is made to rest, is that probability is a relation between propositions. Mathematicians have been used to speak of the probability of *events;* but, primarily, what is probable is the proposition that such or such an event will occur. And the proposition is not

probable or improbable in itself considered; otherwise what was probable on one day could not on the next day become improbable or impossible. Probability is relative to given premises, just as logical necessity is, and indeed logical necessity is merely one extreme which limits the range of greater and greater probabilities. Just as the proposition p may strictly imply the proposition q, so that if p is known to be true the truth of q can be deduced, so p may be a partial ground for accepting q—not necessitating it, not excluding it, but giving it a certain degree of probability. Whether, then, a given intelligible proposition is necessary, more or less probable, or impossible, is not a circumstance which belongs to it in isolation, but depends on the presuppositions in relation to which it is viewed. On the basis of assumptions which I now accept as true, it follows necessarily that the sun will rise again within another twenty-four hours; it is highly probable that the day will be fair; and it is impossible that it should snow. But if my assumptions are changed either by additional information or by the correction of error, the first proposition may lose its necessity, the second may have its probability increased or diminished, and the third may no longer be excluded. In this respect probability and logical necessity are different from truth and falsity. Truth is a quality which belongs, or does not belong, to the particular proposition in itself considered. What has been proved to be true may therefore be asserted independently, without a continual reference to the grounds on which it was demonstrated. But when a proposition has been shown to have a certain probability, the premises of the argument remain essential; the proposition has that probability, not *per se*, but in relation to just those premises; and it will, in general, be found to have a greater or a smaller probability in relation to other premises.

The mind of the philosophical public was well prepared for this doctrine, and I believe that in that public it has met with a very general acceptance; and indeed there is nothing in it that can be objected to as definitely untrue. It is reasonableness itself—so far as it goes. The questionable point lies at the boundary. It is the assumption that we can go no farther; that the probability-relation as it obtains between propositions is something primary and irreducible; that it is *not* to be reduced to a relation that sub-

sists among the contents of the propositions. This assumption gives to probability a curiously mystical character, as of something floating in mid air; and we are not surprised to find that in the last resort our knowledge of probabilities is made to depend upon an original and intuitive perception of the probability of certain propositions relatively to certain others—of all which, however, no example is cited. The situation which thus arises is typical and familiar. Whereas the old dogmatist stoutly asserted his first and fundamental truths, his present-day successor seldom ventures to do so. He merely insists that there must be such truths, without claiming to identify them; though, if they are not identified, it is hard to see what support they can contribute to the actual structure of science. The whole procedure may be regarded as prudent in the presence of the sceptical enemy, but it betrays a vital weakness.

The remedy for this state of affairs consists in taking the next obvious step, in looking just a little way beneath the surface of things. A proposition is not a simple entity, within which no distinctions can be recognized. It has a definite content, which gives it individuality and character; and the logical relations between propositions are at bottom relations subsisting among their contents. If p necessarily implies q, that is because a certain property P is never found apart from a property Q. Similarly, if the hypothesis p gives q a certain probability, that is not an irrational accident. There is a reason for it, which can be seen by looking inside the propositions at the terms which they contain; there is a property P, which, where it is found, gives a certain probability to a certain other property Q. It is this relation between the properties that the theory of probabilities must discuss, not simply the superficial and derivative relation between the propositions as such.

What does this probability-relation between properties amount to? In a simple case that is very easy to see. If the property P determines a class having a finite number of members, the probability of Q relatively to P is the relative extent of the class PQ as compared to the class P. Now this comparison may be made in many ways, with different degrees of exactness. Thus we may say that *most* or *few* or *almost all* or *scarcely any* or *a fair*

proportion of the *P*'s are *Q*'s. In such cases the probability that is ascribed is not strictly numerical. It would be silly to inquire, for example, just where the boundary lies between *few* and *a fair proportion;* and it would be just as silly to ask where *almost impossible* passes into *quite possible,* or this into *somewhat probable* or *fairly certain.* Mr. Keynes has laid a great deal of emphasis on the existence of non-quantitative probabilities, without, however, shedding any light upon the subject; as, indeed, he could not do, while treating his propositions as unanalyzed wholes. However, there is a more exact and illuminating way of exhibiting the relation, which we are often able to employ. If we can count the *P*'s and also the *PQ*'s, we may represent the probability by the ratio of the number of *PQ*'s to the number of *P*'s. If all of the *P*'s are *Q*'s, this ratio is 1, and the probability amounts to necessity. If no *P*'s are *Q*'s, the ratio is 0, and the probability lies at the opposite extreme of impossibility. If some, but not all, of the *P*'s are *Q*'s, the ratio is a common fraction lying between 0 and 1, and its magnitude expresses adequately the degree of probability.

Thus if the hypothesis is, 'This is a card belonging to a full bridge-deck', the conclusion, 'It is a red card', has a probability of one-half; 'It is a diamond', has a probability of one-fourth; 'It is an eleven-spot', has a probability of zero; and that is because half the cards in the deck are red, a quarter are diamonds, and there are no eleven-spots in the deck at all. The probability of one proposition relatively to another reduces to the ratio of the cardinal number of a class to the cardinal number of an inclusive class.

Now the case is not radically different when the property *P* determines, not a finite class, but a class having an infinite number of members. The probability may again be represented by such expressions as, 'Only an occasional *P* is a *Q*', '*PQ*'s are decidedly frequent', etc. But the probability is most definitely conceived as the ratio of the *PQ*'s to the *P*'s. Here, as in all cases where infinity enters in, the ratio must be interpreted as a limit. If there are an infinite number of *P*'s, and yet there is a finite ratio of the *PQ*'s to the *P*'s, this means that as a larger and larger number of *P*'s are considered, the ratio of the *PQ*'s to the *P*'s approaches

this ratio as a limit. If no limit is approached, there is no ratio between the classes, and no definite probability in the matter.

If, for example, the probability of throwing a six with a given die is .17, this means that if the die is thrown repeatedly the ratio of the sixes to the total number of throws will approach .17 as a limit. If I wish to determine what the probability is, I may perhaps do so deductively, on the basis of previous experience; but the most direct and altogether the most conclusive method is to try the particular die out by throwing it a great number of times. I shall return to this point below.

Now it will not escape the reader that this is the way in which probability has generally been considered by mathematicians. It is what Mr. Keynes calls the frequency-theory. There is in it no essential inconsistency with Mr. Keynes' own conception of probability as a relation between propositions. That is a conception which is often convenient, and which can always be adopted with safety when convenience requires it; just as, to put the matter generally, the logic of propositions can always—if one avoids the paradox of Epimenides—be safely used instead of the more fundamental logic of properties. For the general theory, however, Mr. Keynes' conception has the fatal defect which we have noticed above. Because it does not look inside the propositions, but treats them as units, the relation of probability is left in the last resort an unfathomable mystery.

Whether one considers merely the propositions or looks deeper into the properties involved, the relation of probability is perfectly objective, like the relation of necessary implication. The propositions, for example, may be such as no one knows or believes. So far as the general theory goes, they may be such as no one dreams of. Similarly, the properties involved may be any properties whatsoever. When I ask what the chance is of throwing a six with a given die, I do not mean necessarily the probability relative to the properties of the die as I now know them. I may mean the probability relative to the whole body of known or unknown, but constant, properties of the die. This, indeed, is what I measure with greater and greater accuracy as I proceed to throw the die a great number of times, always supposing that the die remains essentially unchanged in the process. It may not occur to me, for

example, that dies are sometimes made of material that is not uniform in weight, or that some of the edges may be longer than the others; or I may have no notion how such factors might affect the result. I simply throw and throw and keep on throwing; and, given time enough, I can measure the probability of a throw with any required accuracy.

In a secondary sense one may speak of probability as 'subjective', when it is relative to hypotheses which someone accepts as true, or to properties which someone attributes to the things under consideration.

Let us revert to the example of the die. The result of any particular throw depends upon two sorts of conditions: first, those which are implied in the general conception that the throw shall be made with this particular die; and, secondly, those which are not so implied. This, it should be observed, is a formal dichotomy. Roughly speaking, it coincides with the division between those conditions which remain constant from throw to throw and those which vary; and it is upon the closeness of this coincidence that the possibility of exact measurement depends. There are, however, two sources of error which may interfere. First, there may be constant factors in the succession of throws, which are external to the die. If, for example, a clever dice-player is doing the manipulating, and if he takes a malicious interest in deceiving me, his intention and his delicate control are among the persistent factors; or, if I do the throwing myself, my own manner of picking up and handling the die may, unknown to me, impart a persistent bias to the results. In such a case the probability that is measured is not simply the chance of throwing a six with this die, but the chance that the dice-player, being so minded, or I shall throw a six with the die. Secondly, there may in the course of the experiment be change in the die itself. It may, for example, become worn in such a way as to favor the throw of a six. In that case, instead of the constant which I suppose myself to be measuring, I am dealing with a variable, and my findings are vitiated. Closely analogous sources of error enter into all scientific measurement. If I measure the distance between two solid objects, my personal awkwardness, the shrinking or expansion of my measuring-stick, or a movement in one or the other object, may cause confusion or

error. There is no method by which such contingencies can be wholly eliminated.

But the inexactness and uncertainty of measurement do not affect arithmetic; and in a perfectly formal and abstract way we may build up an arithmetic, or calculus, of probabilities. This is a branch of pure mathematics, and it has, as a matter of fact, been industriously cultivated. Among the most painfully humorous episodes in the history of science has been the attempt to prove the principles of this calculus by experiment. Dies have been thrown, whist-hands have been dealt, tens of thousands of times in the vain hope that in this way the 'law of great numbers' might be empirically established. One might as well attempt to prove by experiment that four times five is twenty. For suppose the results of the throws and the deals had not conformed to the law; what would that have proved? Only that a disturbing influence had been at work; the die was imperfect, one of the players was a sharper, the record was carelessly kept, or what not. The calculus of probabilities assumes ideally perfect conditions, and its procedure on this basis is purely deductive. It is one of Mr. Keynes' real services to philosophy, that he has protested so vigorously against this experimental tomfoolery.

The calculus of probabilities, then, is objective and *a priori*, just like any other pure mathematics. It is true of all possible worlds, and contains no information about this world in particular. There is no ontology to be extracted from it. On the other hand, there is nothing mysterious about it. The postulates upon which, in a systematic presentation, it may be made to rest, are virtually tautological; they simply constitute the definition of a type of relation.

A bulky literature has grown up with regard to the "principle of indifference", as Mr. Keynes aptly calls it. Correctly stated, the principle is this: (1) that if the whole body of conditions constituting a class of instances are symmetrical with respect to two or more sub-classes, the sub-classes stand in the same ratio to the inclusive class. This contains no more concrete information than the law of contradiction. If in a real instance the ratios of the subclasses to the inclusive class are not equal—if, say, in the case of an infinite inclusive class, a wider and wider examination should *not* bring the sub-classes as known to us nearer and nearer

to equality with one another—, we conclude at once that the constant determining conditions are not symmetrical. It is a very different thing to say (2) that if all the determining conditions with which I am acquainted are symmetrically related to the subclasses, the ratios are equal. To assume this—as, of course, I often do assume it—is equivalent to assuming that my acquaintance with the given subject is sufficient for all practical purposes. But some thinkers have supposed that this second proposition has, independently of the extent of my knowledge, the force of an indispensable postulate or of a self-evident truth. For this position there is not the slightest ground. It results from assuming that no matter what the evidence may be there is always a determinate probability for every conceivable proposition; or, what amounts to the same thing, that there is a definite ratio between the numerical magnitudes of any two classes. Where the classes are infinite, this is generally not the case; and the probability in question is then wholly indeterminate. The subject of 'geometrical probabilities' contains some striking examples of this sort, such as the famous problem: What is the chance that a chord of a circle shall be less than the side of the inscribed equilateral triangle? It all comes down to assuming that if I know nothing either for or against a proposition it has an even chance of being true.

Mr. Keynes' position with regard to the principle of indifference is peculiar. He rightly and very severely criticizes it in its second form, and then tries to correct it by introducing successive limitations, which have the effect of bringing it nearer and nearer to the first form, without quite reaching it. He is committed, for example, to the proposition that if I know only that an urn contains four balls, white or black, there is a probability of 3/8 that two of the balls are white and two black. This is equivalent to assuming that there is in the case of each individual ball an even chance that it is white. There is absolutely no ground for such an assumption.

The second part of Mr. Keynes' treatise is devoted to an attempt at a systematic statement of the principles of the calculus of probabilities, starting from definitions and postulates, and advancing step by step, by a rigorous deduction. The attempt is remarkable in that the author tries to include in its scope the non-

numerical probabilities to which I have briefly alluded. His method, however, is wholly uncritical. It consists simply in picking out those characteristics of numerical probabilities which he finds to be necessary for the demonstration of the principles he wishes to establish, and then assuming without further question that these characteristics belong to the non-numerical probabilities also. There are some errors, most of which are trivial.[1] There is, however, one error which is more serious, and which goes far to destroy the value of the whole development. At the risk of being a little over-technical, I shall give a brief account of it.

If probabilities need not be numerical, what is to be meant by the product of two of them? Mr. Keynes does not assume that any two probabilities can be multiplied together, but only probabilities related in a certain way. Using the expression x/y to denote the probability of the proposition x on the hypothesis y, he assumes only that probabilities related to each other as a/bh and b/h have products; and he *defines* this product (written $a/bh \cdot b/h$) as meaning ab/h. In other words, the product of (1) the probability of a on the joint assumption of b and h, and (2) the probability of b on the hypothesis h, means the probability of the joint truth of a and b on the hypothesis h. Mr. Keynes calls attention to the fact that according to this account of the matter two very different-looking expressions mean exactly the same thing, namely $a/bh \cdot b/h$ and $b/ah \cdot a/h$; for they mean ab/h and ba/h respectively, and these are of course identical. He further announces as an axiom that if P and Q are probabilities and the product PQ exists, then the product QP exists and is identical with it. There is a formal inaccuracy here. According to the precise terms of the definition, if the product PQ exists, the hypothesis of P is more complex than the hypothesis of Q, and the product QP cannot possibly exist. To correct this inaccuracy

[1] Propositions 34, 35, and 46.1, are untrue, and the demonstration of Proposition 49 is unsound. In this last case an inequality of the form $X \not< Y$ is established, and it is then inferred that as Y increases X must do so also. Propositions 46.1 and 49 are ascribed to Mr. W. E. Johnson.

A simple method of testing work like this is to put all the probabilities in fractional form, in the manner indicated below. (This is of course permissible for numerical probabilities, and Mr. Keynes' treatment is intended to include such probabilities, though not to be restricted to them.) The correct formulæ then reduce at once to simple identities.

we must say that in the definition the order of the factors is insignificant; so that by definition the *four* expressions, $a/bh \cdot b/h$, $b/h \cdot a/bh$, $b/ah \cdot a/h$, and $a/h \cdot b/ah$, all mean the same thing, namely, ab/h, or ba/h.

A mathematical definition is a convention according to which one mode of expression may, if one wishes, be substituted for another. It is not essential to the science, except as a concession to the shortness of human memory; and whenever one pleases one may substitute for the defined expression its meaning in accordance with the definition. The definition owes its convenience to the fact that the defined expression is simpler than the expression by which it is defined. If the former is notably more complex, the definition can scarcely have a value. This is the case in the present instance, and Mr. Keynes' definition of the multiplication of probabilities is indeed quite useless. This fact is concealed by the circumstance that in stating the definition he puts first, not the expression to be defined, but the meaning to be ascribed to it. He writes (Def. X):

$$ab/h = a/bh \cdot b/h = b/ah \cdot a/h.$$

Let us see for a moment how this definition works. Letting P, Q, etc., stand for probabilities, division is at once defined as the operation inverse to multiplication (Def. XI):

$$\text{If } PQ = R, \; P = \frac{R}{Q}.$$

It should be noted that if the expression $\frac{R}{Q}$ is to have a meaning, the probability R must have a consequent more complex than the consequent of Q; for in the definition of multiplication the consequent of the product (namely, ab) is more complex than the consequent of either of the factors (namely, a and b).

Now let us turn to the important "inverse principle", which is stated as follows (Prop. 38):

$$\frac{a_1/bh}{a_2/bh} = \frac{b/a_1h}{b/a_2h} \cdot \frac{a_1/h}{a_2/h}.$$

If the first and third fractions are to have a meaning, x must exist

such that $a_1 = a_2 x$. Making this substitution, we have:

$$\frac{a_2 x/bh}{a_2/bh} = \frac{b/a_1 h}{b/a_2 h} \cdot \frac{a_2 x/h}{a_2/h},$$

or,

$$x/a_2 bh = \frac{b/a_1 h}{b/a_2 h} \cdot x/a_2 h.$$

The fraction in the middle cannot be interpreted, since the consequents of the two probabilities are the same; and for a similar reason the equation cannot be true, since the left-hand member has the same consequent (x) as one of the factors on the right.

Let it not be supposed that this is a chance slip, and that it can be corrected without altering the system as such. The point is a vital one, and the weakness which it reveals can only be remedied by a radical revision of the whole scheme. Yet when we look beneath the crust the matter is really very simple. In the first place, there is no reason to suppose that such an operation as multiplication can in any useful way be applied to non-numerical probabilities. Why try to define the product of *generally* and *once in a while,* even for a selected class of cases? Nothing comes of the attempt in Mr. Keynes' work, and the appearance to the contrary is only due to the covert use of the numerical conception.

In the second place, when the numerical probabilities alone are considered, their multiplication is simply the usual arithmetical operation. Let x and y denote, *not* propositions, but the numerical magnitude of the classes determined by the properties X and Y. Let xy denote the numerical magnitude of the class determined by the logical product XY. Let the (arithmetical) product of x and y be denoted by $x \cdot y$. Then the probability of X relatively to Y is simply the fraction xy/y; and the law of multiplication, which Keynes treats as a special definition, reduces to:

$$\frac{abh}{bh} \cdot \frac{bh}{h} = \frac{abh}{h},$$

while the principle of inversion is simply this:

$$\frac{\frac{a_1 bh}{bh}}{\frac{a_2 bh}{bh}} = \frac{\frac{ba_1 h}{a_1 h}}{\frac{ba_2 h}{a_2 h}} \cdot \frac{\frac{a_1 h}{h}}{\frac{a_2 h}{h}}.$$

With a little cancellation this too reduces to an identity; and that is all the proof required.

Let us once more consider the familiar die. We have seen that the chance of throwing a six with it is a probability relative to largely unknown conditions; namely, the actual character of the die in so far as it affects the result in question. These conditions do not, generally speaking, change as we learn or forget about them; and the probability relative to them— 'physical', we may call it—does not change either. There is, however, a very different probability from this; namely, that which is relative to the character of the die as we know it. With every throw that we note and record, this (so-called 'subjective') probability varies. It is necessary to insist upon this distinction, because Mr. Keynes gives explicit recognition only to the subjective type. This is unfortunate, because an essential part of the calculus of probabilities has to do with physical probabilities, and the account which Mr. Keynes gives of it is strangely biased and distorted.

The all-important problem is that of 'inversion', as it is called; namely, to infer physical probabilities from observed frequencies. In a loose way we all do this without much mathematics. If out of a hundred throws with the die twenty-seven were sixes, we should not hesitate to infer that the die was defective and favored the six; that is to say, we should regard it as very probable that the physical probability of throwing a six was greater than 1/6. The mathematical problem is to make this inference more precise. In the investigations to this end the physical probability figures as an unknown constant that is to be determined. Mr. Keynes, for whom all probabilities are more or less exposed to change with our expanding knowledge, finds this essentially irrational; it is trying to find a probability which is essentially subjective, but which is unmodifiable by any further experience.

This misconception of Mr. Keynes' does not prevent him from making some very fine destructive criticism; and it happens that certain mathematicians have laid themselves open to such criticism. Nothing could be more crushing than his refutation of the whole theory of which Laplace's notorious "rule of succession" is a representative feature,—the rule that when, under any given

conditions, an event has occurred m out of n times, the probability of its occurrence on the next similar occasion is $(m+1)/(n+2)$. Mr. Keynes shows that the underlying argument involves an utterly vicious use of the principle of indifference, the assumption being that in advance of any investigation at all *any* proportion of successes on the first $n+1$ occasions is as probable as any other. He also shows the weakness of the argument from the "law of great numbers". Without going into technical detail, we may say that this law shows us that as the number of trials is increased the proportion of successes gives us a more and more trustworthy indication of the probability to be determined; but it affords no clear indication of the closeness of any particular approximation. Mr. Keynes fails to note, however, the valid solution of the problem of inversion, which is based on "Tchebycheff's criterion". It will not be out of place to give a brief account of it here.

Tchebycheff proved, and Mr. Keynes reproduces his proof, that if the probability of an event under given conditions is p, and if L is any number greater than 1, there is a probability greater than $(L^2-1)/L^2$ that on n trials the proportion of positive instances will lie between

$$p+\frac{L\sqrt{p-p^2}}{\sqrt{n}} \quad \text{and} \quad p-\frac{L\sqrt{p-p^2}}{\sqrt{n}}.$$

This is the famous criterion. Its meaning may be illustrated as follows. Suppose I have an ideally perfect die, so that the chance of throwing a six is exactly 1/6. I am about to throw the die 900 times. On this supposition it is not very probable that I shall get exactly 150 sixes, although that is one-sixth of the total number of throws. (Indeed, if I were to throw 901 times, I could not possibly get exactly one-sixth that number of sixes; I must get more or less.) On the other hand, it is very probable that the number will be *about* one-sixth of the total. Tchebycheff shows us how we can refine upon this vague statement. Taking the arbitrary number $L=2$, we have: There is a probability greater than 3/4 that the proportion of sixes will lie between the limits, $1/6 \pm 2\sqrt{5/30\cdot 6}$, that is to say, that the total number of sixes will not be greater than 172 nor less than 128.

The problem of inversion is then as follows. Instead of having

an ideally perfect die I have an ordinary bone one. I throw it 900 times and get 144 sixes. What is the chance of throwing a six with this die? I know that the chance is very probably about 144/900, or 16 per cent. Can I by means of Tchebycheff's criterion substitute numerical limits for this 'very probably' and 'about'? To put the matter generally, suppose the actual proportion of sixes is r. Can I determine p in terms of r? The criterion tells me that there is a probability greater than $(L^2 - 1)/L^2$ that p lies between

$$r \pm \frac{L\sqrt{p - p^2}}{\sqrt{n}};$$

but this formula contains the unknown p. I now reflect that p is a number not less than 0 and not greater than 1, and that as it varies between these limits the maximum possible value of $p - p^2$ is 1/4, the value which it has when $p = 1/2$. Substituting this maximum value in the above limits, we reach the conclusion that, if L is any number greater than 1, there is a probability greater than $(L^2 - 1)/L^2$ that p lies between

$$r + \frac{L}{2\sqrt{n}} \quad \text{and} \quad r - \frac{L}{2\sqrt{n}}.$$

These limits are wide. They can often be considerably narrowed by devices which need not concern us here. What is important for us to note is that they are logically established,—always on the supposition that there is a definite, constant probability p to be found. If in 10,000 throws of my die I get 16 per cent. of sixes, then, taking $L = 2$, there is on this evidence a probability greater than 3/4 that the chance of throwing a six with this die lies between 15 per cent. and 17 per cent. Or, taking $L = 4$, there is a probability greater than 15/16 that the chance of throwing a six with this die lies between 14 per cent. and 18 per cent.

In proportion as the square root of the number of throws increases, the limits converge, and by making the number of throws large enough we can bring the limits as close together as we please. Thus if we throw our die a million times instead of a mere ten thousand, the distance between the limits is divided by ten, provided that the die is unworn in the process. In statistical inquiries

the number of instances is, of course, often far greater than a million. The trouble is that in such inquiries we have less reason, than we have in the throwing of a small bone die, to suppose that the conditions which determine the class under investigation are constant and that a definite probability is thus implied.

The most noteworthy feature of the formula for inversion based upon Tchebycheff's criterion, is that it involves *two* probabilities. That is because it involves two logical genera, determined by very different properties. In the simple case which we have considered one of the genera is the class of throws with the particular given die. This genus is essential, because it is that die which we continue to throw, and it is its relevant properties that constitute the permanent conditions of the whole series of events. The other genus is the class of those series of trials under constant conditions which yield the given number of positive results for the given number of trials. This genus is essential, because the figures yielded by the application of the formula apply not simply to the given series of trials but to any series that yields like total results so far.

It should now, I think, be plain to the reader why Mr. Keynes was unable to appreciate the full significance and importance of the criterion, and in particular its application to the problem of inversion. His subjectivism is partly to blame. Subjectivism does not mix easily with science. But a more fatal handicap is his assumption that the probability-relation subsists between propositions as such, and not rather between classes or their determining properties.

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SCIENCE, PHILOSOPHY, AND CERTAINTY.

IT is widely believed today that the physical sciences prove their conclusions, while philosophy fails to do so. Probably the philosophers themselves would, if pressed, admit that their views are not rigorously demonstrated. The time has passed when each school of philosophy regarded its own tenets as finally established, and all the rest as refuted; however convinced he is of his own conclusions, the philosopher is now candid enough to confess that he cannot by unquestionable evidence compel the assent of his opponents. Perhaps some of the more zealous look with confidence to the development of an exact logic, engine of demonstration for a metaphysic based upon the results of science; at present however they would probably admit that rigour of proof on ultimate questions has hardly been reached. And the very fact that the more hopeful seek such a rigour shows that they feel the need of a certainty equalling that of the sciences. In their emulation of these, they are today as far as possible from the arrogant claim of superior knowledge, of which in the young days of science they were indignantly accused.

Nevertheless I shall offer reasons for believing that their envy of scientific certainty is needless. In the first place, that certainty will be found to be largely a matter of social agreement; and social agreement is a very different thing from proved verity, though indeed it always tends to usurp the prerogatives of the latter. In the second place, quite apart from the matter of social agreement, scientific results, based as they are upon analysis, will be seen to be intrinsically temporary and doomed to revision from the bottom up. And with that the possibility will appear that metaphysical doctrines possess a greater certainty than scientific.

The certainty of scientific conclusions seems clearly enough to rest on either or both of two grounds: observation by the senses, and mathematical reasoning. Most people would not hesitate to say that each of these provides the acme of certainty known to human beings. We are in no doubt whatever of that which we directly see, and we cannot possibly question the truths of mathe-

matics. The theories of metaphysics, on the other hand, are neither verifiable by the senses nor deducible by symbolic computation, and hence are open to doubt.

Let us then inquire into the reason for the assurance with which we accept sense-observation and mathematical reasoning. Beginning with the former, let us ask: why is what we perceive with our senses so highly accredited?

The answer that naturally occurs to us is that sense-perception, unlike introspection, or the voice of conscience, or metaphysical insight, is observation of a public subject-matter; it is open to confirmation by the observer's fellows. What one man sees, another can see if he looks; so too with what one hears or touches. In respect of vision, hearing and touch, all normal men are practically alike. Smell, taste and temperature are more liable to variation with the individual, and they play but a small part in scientific investigation. Vision is peculiarly the scientist's sense, being socially verifiable over a far wider range of phenomena than hearing and touch. Aided by the microscope and telescope, vision penetrates regions whose remoteness or minuteness is beyond the sharpest auditory or tactual discrimination. The scientific experiment is, with few exceptions, an appeal to the vision of one's fellowmen. Thus, it will probably be urged, the fact that scientific results are expressed chiefly in visual terms argues that their certainty lies in the social verification to which visual phenomena so readily lend themselves.

It is true also that visual objects, being spatial, are more precisely measurable than those of other senses; but this property is connected with the certainty that belongs to mathematical reasoning, which we are not now considering.

And indeed it is when we view them in respect to social verifiability that the difference between visual observation and metaphysical speculation seems to stand out most clearly. The metaphysician cannot truly say, 'let all men turn the eye upon the principle of individuation, or the moral choice, and they will see just what I see'. Unable as they are to turn the eye, they can only intend the mind; but when they do that their reports fail to agree. The test and ground of certainty then appears to be public confirmation, or unanimity. That is why it is only the physical

sciences that show solidly established results. And we note that the preference of the biologist for mechanistic explanation rests on precisely this basis. Mechanism, which here amounts to materialism, finds physical causes for physical effects; such causes alone are capable of social verification, since nothing but the physical can be observed by more than one person. The preference for mechanism is the preference for a result open to social confirmation.

The certainty which we ascribe to sense-observation appears then at bottom to be nothing else than a social affair, *viz.* confirmation by many. And we must now ask whether such confirmation really gives what it is claimed to give. Is it coercive proof? Is it truly equivalent to certainty?

The most obvious reason in favour of such equivalence is that we have here a case of circumstantial evidence, or inverse probability; the coincidence of many observers seeing the same thing would be too improbable, unless that thing were a fact.

Now it is doubtless proper to argue from such a coincidence to a common cause. But on what ground is it argued that this common cause is the fact? Collective hallucinations have a common cause. The consensus of a savage tribe or other primitive community on some matter of right and wrong has a common cause. But who would assert that that cause is the fact or truth about which they opine? The source of their agreement might be anything, so long as it is one and the same for all individuals. It seems clear that the mere fact of agreement contains no implication that the agreeing judgments are true.

But perhaps we have not stated the case fairly. Should we not put it thus: each sense-observation has by itself a good probability of truth, and therefore the coincidence of many agreeing makes that probability so strong as to amount to certainty? Now such a statement implies that the greater the number of verifications, the greater is the probability, and the fewer the verifications, the further we are from certainty. Yet in the experimental sciences certainty is assumed without actual verification by more than a few observers. It is safe to say that relatively few physicists have performed or even witnessed Michelson and Morley's famous experiment; yet scarcely anybody now doubts its verity, and that too notwithstanding its unexpected result. Is it answered that we

know that every one could verify it if he chose? That however is known only because a few competent observers have verified it. One man's verification would in fact be enough, were he assuredly competent. Is it that one competent observer is taken to represent all others? That simply means that all others are the same as he. Verification by others in ever increasing numbers is not at all required; all that is needed is the assurance that he really did observe what he claims, and such assurance is given by the confirmation of a few observers whom we trust. All that social confirmation does is to persuade the rest of us that one man actually saw a definite event. Social verification thus reduces itself to his single unambiguous observation. It is not the numbers that count, but rather the presumed verity of one observer's direct experience. We must conclude that it is not a matter of combining probabilities till we get certainty, but of satisfying ourselves by a minimum of social confirmation that a fair observation was made. The observation itself contains all the certainty there is.

Perhaps it will be answered that the practice of mankind gives the lie to this statement. From the lawcourts and judgments of good taste to the mystical union with God we find men respecting the agreement of independent witnesses. Why not then in science?

The reply is that science differs essentially from all the rest. The lawcourt, the æsthetic judgment, the religious ecstasy, are concerned with subject-matter which is transfused with a subjective element. This is obvious in the two last; it is equally true in the first. The witness in court generally testifies to that of which he was but a casual observer. Not knowing at the time the significance of what he saw, he did not observe for the sake of the whole truth and nothing but the truth. His observation was thus liable to individual distortion, and as recalled in memory is still more so, in virtue of the interpretation he may now put upon it. Readers of Münsterberg's book *On the Witness Stand* are well aware of this liability. In such a situation there is need of confirmation by other witnesses, and the argument from inverse probability is quite in order. Not so is it with the scientific experimenter, who of set purpose is concerned with the truth for its own sake at the time of his observation. True, even the scientist may distort his data; but the distortion is likely to be a minimum,

and—as we have seen—the needed social confirmation is a minimum. Moreover, even the witness in court may need only a little confirmation. Cross-examination may substantiate his testimony, as when he tells a consistent story, unshaken by suggestion or insinuation. In that case the test is coherence of his statements. Only in so far as there is reason for doubt of his having actually observed what he claims, is confirmation necessary. Here, as with the scientist, social verification is not the purveyor of certainty; all the certainty there is comes from the single observation.

When a number of people watch a scientific experiment, or when many scientists repeat an experiment, there is no question of pooling the common result and weeding out the differences. Each observer at once and by himself sees the fact; there is no conference between them as if they were in committee deciding on some measure by compromise. Such deciding is characteristic of practical life, where interests clash and we must get something done; but science is not concerned with getting something done. It is concerned with the truth for its own sake, and that alone. And with that motive each observer is convinced directly by his own beholding.

We may well admit the Kantian position, that fact is constituted by universals, the same in many contexts and identical through the very differences in which they appear. Sameness-in-difference however gives no ground for a social appeal; what it demands may be supplied by a single individual whose many experiences constitute a coherent unity.

Why then do we find the persuasion so general that agreement is the test of certainty? I suggest that it is because, social beings that we are, we desire to convince others of the truth we see. When they agree with us, we are comforted; the greater the number that agree, the more we are comforted. This comfort lulls us into a feeling of security; no one will dispute us. And this we easily mistake for the certainty of truth. Thus the theory, that science owes the certainty which metaphysics does not possess to social verifiability, rests simply on a confusion.

But the social theory of truth is strongly intrenched in the modern mind, and no doubt it will be asked whether one could believe that $2 + 2 = 4$ if everyone else disagreed with him. There

are two answers. In the first place, many pioneers of thought have done what the objection denies. The founder of Christianity believed his doctrines, so far as we know, when no one agreed with him, and social verification was out of the question. In the second place, obviously one would *hesitate* to accept a view which those who ought to know agree in condemning. The reason for that is that we are all fallible, and overlook objections that another may see. But it is irrelevant from what source these objections come; they are no better and no worse coming from another than from one's self. In the end all views and all objections are brought before the bar of private judgment; the social judgment itself is so brought. Private judgment is inevitable, and no one can go beyond it. The monad stands alone before the universe, which he must reflect in his own way, and no certainty can come to him except by his own clear vision.

To find in unanimity a guarantee of truth is as reasonable as to declare that the agreement of a file of men doing the goose-step is a warrant of the grace of their postures. If the alleged certainty of sense rests on no other basis than its social confirmability, it is quite specious.

And indeed we might have said at the outset that the agreement of many is but the fact that they see alike, and no implication of objective reality can be drawn from that likeness. But it has so often been urged that the agreement of scientists when compared with the disagreement of metaphysicians shows a superior certainty in the former, that it has been necessary to lay bare the underlying confusion, and to re-affirm the tautology that agreement is only agreement.

May there be however an intrinsic certainty in sense-observation, quite apart from its social quality?

Certainty of a kind no doubt there is, but it is not the kind which is pertinent to the quest for final truth. Sense gives the certainty that we have before us a specific identifiable object; it gives no certainty as to the nature of that object in detail. In Leibnizian terms, sense gives clear but not distinct knowledge. Now it is distinct knowledge that is the aim of science. We know by sense that there is before us a wooden table; we are beyond doubt on that point. But as soon as science gets to work on the

nature of wood we find that the certainty applies only to the identification and the practical uses of the object. Sense gives no certainty as to what the object really is. The wood looks and feels smooth and continuous; we learn that it is neither, being made of discrete particles—molecules—which in turn are groups of atoms of C, H, etc., which themselves are constellations of electrical charges. Notice that sense-perception is not merely supplemented by this distinct knowledge; it is contradicted. The apparently continuous, so certain to sense, is given the lie by reflective analysis. The distant object, seen smaller than when it is near, is proved to be of equal size, the converging rails to be parallel, the colours to be waves or bullets of radiation, the heat to be motion, and so on. And the revision of the data, once begun by science, threatens to go on without end. We were once assured that our atoms were small round objects, all alike for each substance: an imagined sense-perception in terms of vision and perhaps of touch. When this so clearly pictured result is more distinctly known we find that the atoms are neither round nor always quite alike even for the same substance. When we got down to the electrons we were told to picture them as discrete spheres separated by intervals much greater than themselves. Later we learned that they were not in the usual sense bodies, but *loci* of energy with probably no definite boundaries. We now give up our former law of the indestructibility of matter, believing that positive and negative charges may fuse and convert their mass into radiant energy. By this time we have gone so far that we recognize frankly the provisional character, that is, the uncertainty, of our latest results. We see that the history of physics is a record of corrections of results once deemed fully demonstrated. We recall the finality accorded to Galilean and Newtonian mechanics and to the wave-theory of light, and we become aware of the almost total revision of the science of those days which has been brought about by the electrical theory of matter, the theory of relativity, and above all by the quantum-phenomena. We also remind ourselves that the law of the dissipation of energy, once a deadly weapon of the materialist, is by the latest reports far from being an ultimate certainty. We are now ready to appreciate the words of an eminent physicist: "We have at present no one

consistent scheme of interpretation of physical phenomena, and we have become wise enough to see and to admit that we have none. We use the wave theory, for example, where it works; we use the quantum theory where it works; and we try to bridge the gap between the two apparently contradictory theories, in purely formal fashion, by what we call the correspondence principle. It is true that we are slowly learning more of the rules in nature's game, so that our progress is not made by hit or miss experimenting, nor by random theorizing, but by following a more or less systematic if not always a strictly logical procedure; but the day has gone by when any physicist thinks that he understands the foundations of the physical universe as we thought we understood them in the nineteenth century. The foregoing discoveries of our generation have taught us a wholesome lesson of humility. . . . We have learned not to take ourselves as seriously as the nineteenth century physicists took themselves." [1]

The lesson which we learn from the history of physics is that results which seem final are always liable to revision, even to the extent of contradiction. Knowledge of the physical world progresses from the clear to the distinct, which again serves to provide a clear picture and in turn must be made distinct, and so on without end. What is clear datum at each stage is liable to correction as analysis discovers finer detail. Thus science, proceeding from the practically certain base of sense-observation, and with agreement of experts all along, builds an edifice which obliges us to re-lay the foundation; the structure, instead of being more firmly welded, is constantly undermined, laid anew, undermined again, and so on. There is no reason to expect that we shall reach a final certainty; there is every reason to believe that we shall not, since analysis ever discovers new facts which oblige us to revise our old data. Thus sense-observation, apparently most certain of all our knowledge, becomes in the end just that which is essentially uncertain. A kind of knowledge which does not proceed by analysis, but rather by additive description, might perhaps claim finality; but such is not the nature of our knowledge of the physical world, and such is not the information vouchsafed by that most advanced of all sciences, physics.

[1] R. A. Millikan, *Evolution in Science and Religion*, pp. 27–28.

In the above we have centered attention upon the inorganic; a like conclusion would seem to hold for biology. Owing to the complexity and the transiency of vital phenomena, biology has scarcely got so far as even to attempt the explanation of the fundamental vital processes. We have no accepted theory of the nature of conduction, of growth, of response to stimulus, of mitosis, of differentiation, or even of heredity. We have discovered a vast wealth of sense-data (chiefly microscopic); we have theories of stronger or weaker probability as to the mechanism of heredity, of mitosis, of neural conduction—theories however which do not bring us down to supposed ultimate laws like those of physics. Yet even if we had a generally accepted theory for each of these processes, we could hardly expect it to escape the fate of past physical theories. The certainty of revision is present in the one case as in the other; for that certainty attends all analytic knowledge of sense-data.

The alleged certainty of science, so far as it rests on sense-perception, is in fact an idol of the theatre, dating from the early days when science dealt with gross bodies alone. This tradition, already moribund among physicists, is perpetuated with the laity (including the humble philosopher) by the enormous prestige of practical application. Radio and gasoline-engine daily overwhelm the truthseeker who reflects about ultimate certainty. His doubts seem petty indeed before the ten-ton truck which rushes upon him or the steel-and-concrete office-building which rises fifty storeys into the air. And in fact the latest refinements of scientific experiment, while they do oblige us to revise our theory of nature, make differences to our machines which are so slight as to be negligible. Gross bodies that they are, those machines are not practically affected by relativity, quanta, or cosmic rays. And thus the still small voice of reflection is drowned by the heavy guns of applied science.

We turn now to the second reason assigned for the certainty of scientific results, *viz.* the unquestioned truth of mathematics. Here we might be content to say that mathematical objects are ideal, and therefore their application to the material world can never be more than approximate, that is, to some degree uncertain. But I think we should go much further. If we examine the views

of some present mathematicians as to the ground of their proofs, we find that the rigour of those proofs, like the inner nature of the physicist's objects, is open to a little suspicion; the reason being that the nature of number—admittedly fundamental for most if not all mathematics—is not known beyond all doubt.

Those who toward the end of the last century attempted to define number, and to state the ultimate principles of numerical reasoning, thought to do so by the use of the concept of an infinite collection. Now this concept was soon found to involve certain well-known paradoxes; and it was here that dissension arose. The solution of these paradoxes has been alleged to lie in three quite different directions, giving rise to three schools; "those engaged in laying the new foundations of analysis fall into three groups: (1) the logistic: the Italian school is led by Peano, the English by Russell and Whitehead. (2) the axiomatic: led by Hilbert. (3) the intuitionist: led by Brouwer."[2] The view of the first school is that all mathematics forms part of a more general science, logic. The contradictions are alleged to be solved by the logical theory of types, and by an axiom called the axiom of reducibility. These however have not been universally accepted. Thus we find one defender of the general logistic position saying of the axiom of reducibility "This axiom there is no reason to suppose true, and if it were true, this would be a happy accident and not a logical necessity. . . . Such an axiom has no place in mathematics, and anything which cannot be proved without using it cannot be regarded as proved at all."[3] Different ways out of the contradictions are found by the other two schools, the axiomatic and the intuitionist. The axiomatic school (also called formalist) regards logic as an abstraction from mathematics (in opposition to the view of the logistic school) and finds all mathematics to be a development, by means of suitable axioms, from certain concepts of the finite whose meaning lies solely in the relations which the axioms attribute to them. The infinite collection is here no presupposition, but an addition due to a special transfinite axiom. To prove the freedom of a given concept from contradiction it is

[2] J. Pierpont, "Mathematical Rigor, Past and Present", *Bull. of Amer. Math. Soc.*, Jan.–Feb., 1928, pp. 44–45.

[3] F. P. Ramsey, "The Foundations of Mathematics", *Proc. London Math. Society*, 2nd series, Vol. 25, 1925, pp. 358–359.

sufficient to show that the attributes of that concept exemplify the properties of the numbers. Thus "Hilbert beweist die Widerspruchslosigkeit seines Axiomensystems dadurch, dass er seine Axiome realisiert, und zwar nicht nach dem Muster Euklids räumlich-anschaulich, sondern arithmetisch, durch Zahlen. . . . Damit ist zunächst die Widerspruchslosigkeit der Geometrie auf die der Arithmetik zurückgeführt; diese letztere kann man aus der Widerspruchslosigkeit des Rechnens mit ganzen Zahlen folgern."[4] The series of finite numbers here serves as the foundation of mathematics; a series, however, which is defined not by the intrinsic meaning of each number, but by the relations which the axioms confer upon them. In the dominant rôle played by the axioms, apart from any intrinsic meaning in the concepts themselves, consists the pertinence of the name *formalist,* which is applied to the school of Hilbert.

In agreement with this respect for the numbers, the intuitionists Brouwer and Weyl find the series of whole numbers to be the basis of mathematics, and logic to be an abstraction therefrom. This series, however, is a primary intuition, and nothing has mathematical existence which does not lie in this *Urintuition,* or cannot be constructed from it. Contradictions arise in mathematics when we apply symbolic reasoning beyond such intuitive construction. The continuum is not a static being, but a medium of free construction. Hilbert's axiomatic procedure is likened to a game of chess, which indeed follows certain rules, but remains arbitrary and quite disconnected with objective truth. Such truth is assured only when we find a sense in the concepts which is drawn from our intuition. Weyl thus writes: "soll Mathematik eine ernsthafte Kulturangelegenheit bleiben, so muss sich mit dem Hilbertschen Formelspiel irgendein Sinn verknüpfen."[5] The transfinite numbers are hereby declared nonexistent; much indeed of present-day analysis goes by the board. "Vor allem werden die meisten Begriffe, Methoden und Lehrsätze der allgemeinen Mengenlehre (namentlich fast alles über das Abzählbar-Unendliche Hinausreichende) und ein sehr grosser Teil der modernen Analysis, besonders der Theorie der reellen Funk-

[4] R. Baldus, *Formalismus und Intuitionismus in der Mathematik,* 1924, p. 15.
[5] H. Weyl, *Die heutige Erkenntnislage in der Mathematik,* p. 30.

tionen, ungültig und sogar sinnlos, die Mengenlehre zu einem 'interessanten pathologischen Fall' in der Geschichte der Mathematik."[6] But let us hear the words of Brouwer himself. Science, he tells us, is "systematic cataloguing by means of laws of nature, of causal sequences of phenomena . . . that is, sequences of phenomena which for individual or social purposes it is convenient to consider as repeating themselves identically—and more particularly of such causal sequences as are of importance in social relations".[7] The student of philosophy will note the pragmatic tenor of these words. Such laws, he continues, are "not proof against sufficient refinement of the measuring tools",[8] but up till now the laws of arithmetic and geometry have been considered absolute and exact. Both formalists and intuitionists, however, "have reached agreement as to this, that the exact validity of mathematical laws, as laws of nature, is out of the question. The question where mathematical exactness does exist, is answered differently by the two sides; the intuitionist says: in the human intellect, the formalist says: on paper."[9] The material from which mathematics is made is the number-series. The Kantian intuition of space is abandoned; numbers alone are retained, and these are in the end the numbers one and two with the peculiar relation of repetition connecting them. "This intuition of two-oneness, the basal intuition of mathematics, creates not only the numbers one and two, but also all finite ordinal numbers, inasmuch as one of the elements of the two-oneness may be thought of as a new two-oneness, which process may be repeated indefinitely; this gives rise still further to the smallest infinite ordinal number ω. Finally this basal intuition of mathematics, in which the connected and the separate, the continuous and the discrete, are united, gives rise immediately to the intuition of the linear continuum, *i.e.* of the "between" which is not exhaustible by the interposition of new units and which therefore can never be thought of as a mere collection of units."[10] Whereas the formalist presupposes a static

[6] A. Fraenkel, *Zehn Vorlesungen über die Grundlegung der Mengenlehre*, p. 48.

[7] L. E. J. Brouwer, "Intuitionism and Formalism", translated by A. Dresden, *Bull. Amer. Math. Soc.*, Vol. 20 (1913–1914), pp. 81–82.

[8] *Ibid.*, p. 82.

[9] *Ibid.*, p. 83.

[10] *Ibid.*, pp. 85–86.

world of mathematical objects, independent of the thinking individual, the intuitionist admits only such objects as are actually constructible from the number-series. It is meaningless to say for instance that the laws of logic must hold of infinite series, when these series cannot be constructed. In particular, the law of excluded middle does not hold of unknown terms of such a series. It is not true for Brouwer that there either are or are not more than five prime numbers that satisfy the formula $2^n + 1$. We have found only five such numbers,[11] but we cannot construct all prime numbers, and none has being until it is constructed.

To characterize the whole situation in Professor Pierpont's words: "Elaborate attempts are now in progress to give mathematics a foundation as secure as it was thought to have in the days of Euclid or of Weierstrass." The same writer continues, "Personally we do not believe that absolute rigor will ever be attained, and if a time arrives when this is thought to be the case, it will be a sign that the race of mathematicians has declined."[12]

I submit, then, that there is a close parallel between the knowledge of the physicist and that of the mathematician. The surface character of perceptual objects neither the physicist nor anyone else doubts; the truth of $2+3=5$ and other such elementary propositions neither the mathematician nor any one else doubts. But the true nature of any perceptual object is by no means certainly known to the physicist, and the true nature of any number—whether it is an ultimate intuition or a derivative concept formed out of simple notions or an entity to be defined wholly by the axioms of its employment—that true nature is far from certainly known. Until it is known, mathematical proofs will lack rigour; for the science of mathematics they will not be proofs, but mere beliefs, however universal and inevitable. The reason for this decreasing certainty, alike in physics and mathematics, appears to be that for them the nature of any entity depends upon the nature of its elements. The whole cannot be certainly known until the elements are certainly known. Both physics and mathematics are built upon this rational-analytic presupposition. And so is biology in its mechanistic procedure.

[11] The example, used in a slightly different connection, is from O. Becker, "Mathematische Existenz", in *Jahrbuch für Philos. u. phänom. Forschung*, Vol. 8, p. 451.

[12] *Op. cit.*, p. 23.

Where then can we find a certainty not subject to revision? If sense-facts did not owe their nature to the elements composing them, sense-perception would so far possess unquestionable truth. And a little reflection shows that in some degree our perceptual judgments have such truth. "Men live and die" is indubitably a truth, though we do not know the fundamentals of life or death. Such truths are of the nature of more or less total and unitary visions, however small the totals which they envisage; they are to that extent independent of any analysis to come. While this may not be the case with all of our sense-percepts, it is clearly the case with some. This suggests that there may well be judgments of wide sweep, statements about the universe as a whole, inductions perhaps generalizing from many undoubted facts, which possess a similar certainty independent of future analysis. Such, in fact, the theses of metaphysics claim to be. They are in a sense like the judgments of beauty; for beauty is directly seen and does not depend upon analysis. As a thing of beauty is a joy forever while a scientific theory is intrinsically mortal, so a metaphysical system, setting forth certain persuasive traits of reality, may be perennially true. I do not mean that philosophy has an exclusively artistic or intuitional character. While intuition (the gift of making fertile generalizations) may be necessary, it is useless without inductive confirmation; and it is on the inductive side that reason finds employment. Thus a metaphysical doctrine, well grounded upon facts of experience, might have a certainty which no scientific proposition or mathematical deduction could hope to possess.

Of course, if all the metaphysicians really disagree they cannot all be correct. But that better understanding of the history of philosophy which began with Hegel and marks our advance over the older schools, shows the agreement to be deeper than they thought it to be. Leibniz and Hegel can agree with Democritus that mind is nothing without its bodily expression; Aristotle and St. Thomas recognize the being of the Platonic Idea; Schopenhauer and Fichte alike testify to the ultimacy of activity; and so on. In some points, such as the freedom of the will or the problem of evil, we still find as obstinate a conflict as could be imagined; but who has alleged that *all* the positions taken by philosophers are sound?

We cannot assert that any metaphysical doctrine is rigidly proved; but we may insist that some metaphysical doctrines are true and that their truth is independent of further analysis. The claim of truth must no doubt be based largely on plausibility due to inductive evidence; that is, one must show that the ultimate principles which he defends are born out by admitted facts. But those principles themselves cannot be deduced; from what indeed could one deduce them? Science is never final; mathematical demonstration is never quite rigorous. The ultimate principles will be to the individual his self-evident truths, or postulates of reason, or dogmas—the name will vary according to the point of view of the thinker. Yet the mere affirmation of them, however self-evident they may appear, will not suffice; they must be shown to cohere with the empirical content of observation. And with this the possibility, at least, of ultimate certainty lies open to metaphysics as to no other rational discipline.

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THE PSYCHOLOGICAL POINT OF VIEW.

THIS article will investigate the common distinction of the logical from the psychological. Though the distinction is now on everybody's lips, it is an essentially modern one. Neither among the ancient Greeks nor in the Middle Ages was there anything quite corresponding to it. It is a distinction which has always given me difficulty, and it is with the setting out of my difficulties that I shall mainly be concerned.

I.

Logic and psychology are now the names of two sciences. These sciences are held to be quite different from each other, and it is usually supposed to be quite easy to explain the difference between them. They differ fundamentally, it is said, in their points of view; and this antithesis of the logical and the psychological points of view has been widely used outside the specialised study of the two sciences involved. It has been employed particularly for the definition of what are called the 'philosophical' or 'normative' sciences (called also by Hegel 'the sciences of objective mind' and by contemporary German writers the *Geisteswissenschaften*), such as ethics, æsthetics, political science and theology. The point of view of all these sciences is said to be logical as opposed to psychological. And since just before the beginning of the present century it has been widely believed that the subject-matter of these sciences, or at least of some of them, may, besides being studied in this logical way, also be successfully and profitably made the object of study carried on from the quite different psychological standpoint, thus giving birth to still another series of sciences. Accordingly, parallel to the distinction between the foundation-sciences of logic and psychology, a distinction is made between the logical group of sciences (ethics, æsthetics, politics and theology) and the psychological group (the psychology of morals, art, political life and religion respectively). It should be added that the distinction is sometimes spoken of as between

the psychological and, not the logical, but the epistemological point of view; this designation being derived from the name epistemology, which denotes yet another science of mind, distinguished from, but most nearly related to, the science of logic.

Now with this distinction of logical and psychological there is introduced into the classification of the sciences what appears to be an entirely novel complication. For in logic and psychology we have two sciences which cannot be distinguished by their subject-matter but only by the points of view from which they approach a common subject-matter. Two quite separate sciences which nevertheless study exactly the same phenomena, only in different ways—am I right in thinking that this is something quite new in scientific history? Similarly, the whole series of *Geisteswissenschaften* covers the same ground as the parallel series of 'psychologies', as, for instance, theology or the philosophy of religion covers the same ground as the psychology of religion; but from a different point of view.

It is true that not all teachers of psychology have felt obliged to admit the impossibility of finding for their science a subject-matter totally distinct from such other sciences as logic, epistemology, ethics, etc.; but by all the most distinguished masters of the subject this has been admitted long ago. A well-known discussion of the matter is in the opening columns of James Ward's article on Psychology in the *Encyclopædia Britannica*. Clearly the antithesis of subjective and objective will not suffice us; for we cannot say that psychology deals only with the subject of knowledge, and logic and the *Geisteswissenschaften* only with its objects. In both cases the object of attention is really *the knowledge itself*. Holding then that the distinction can only be one of standpoint, Ward's suggestion is that the standpoint of psychology is *individualistic*, that of the other sciences being universalistic. But if this means that psychology deals only with the mind of the individual, it would seem to be no longer true; for in recent years we have heard much of mass-psychology, of the psychology of crowds and of *Völkerpsychologie*. And surely it was always clear that what the psychologists were dealing with was the analysis of the typical mind, or of minds in general, rather than the analysis of this or that particular mind—as indeed Ward goes on to point out, saying

that psychology is not biography.[1] Our difficulty, then, is not yet solved.

Before examining other suggestions that have been made for finding a distinction of standpoint between logic and psychology, let us explore the possibilities of a way of distinguishing them that has not yet been mentioned. For there is no doubt that many of those who have discussed this matter have not had sufficiently before their minds the very obvious and elementary fact that psychology differs from logic, epistemology and the normative sciences at least in this respect, that, though indeed its subject-matter is not distinct from that of these sciences, yet it covers a far wider field of subject-matter than any of them and at least as wide a field as all of them taken together. Psychology is concerned with mental experience as a whole, *i.e.* (if we follow the familiar tripartite analysis) with cognition, affection and conation. Epistemology covers only the first of these, cognition. Logic deals with a narrower field still, with one kind of cognition, *viz.* intellection or reasoning. And so with ethics, æsthetics, etc.; the field in each case being much narrower than the whole field of psychology. That we have here an important part of the required difference I do not doubt. Is it possible that we have here the *whole* difference? Is epistemology simply a third part of psychology, the psychology of the cognitive process? Is logic only the psychology of reasoning? And again, conscience being plainly a psychological entity, is ethics only the psychology of conscience?

Against such a view much outcry will be raised, and with the outcry will come many further proposals for a distinction, not merely of territory covered, but also of point of view, between the two sets of sciences. Let us examine four of these in turn.

II.

It will be said, for one thing, that the psychology of reasoning tells us only how we actually do think, whereas logic tells us how we ought to think.

But this will not do. For, as a matter of fact, the reason most of us would give for consulting a textbook of logic is not a desire

[1] With further possibilities of meaning in this distinction of Ward's we shall deal below.

to discover how we ought to think, but precisely a desire to have our minds cleared up as to how we are in the habit of thinking. I remember once noticing Professor Dewey's book *How We Think* cited in a bibliography as *How to Think;* and this typifies a mistake that is too often made concerning the purpose of logical study. Logic, after all, is not an art but a science. Its aim is to anatomise the actual structure of thinking. This is Aristotle's view of it. His name for it, significantly, is "analytics", and what he aims at in his *Prior Analytics* is "at laying bare the structure which he regards as common to all reasoning".[2] And in our own time it is significant that Bernard Bosanquet should have called his great work *Logic or the Morphology of Knowledge,* a title which suggests nothing if not the faithful description of the forms of thinking actually in use. "In giving to the present work the title 'Morphology of Knowledge'", he tells us, "I intended to indicate as its purpose the unprejudiced study of judgement and inference, throughout the varied forms in which their evolution may be traced and their relationships determined." The aim of logic is thus "the analysis of knowledge as a systematic function". And "Logic has no criterion of truth nor test of reasoning"; though it is added, by way of admission, that "it is indeed impossible to study the growth of knowledge without lighting upon confusions of thought that evoke a warning word".[3]

Such being the task of logic, there seems to be no need to look beyond logic to a separate 'psychology' of reasoning in order to learn how we *do* think. But are we also to conclude that it is no part of the business of logic to tell us how we *ought* to think? Bosanquet, apparently, would so conclude; indeed we have been directly told by Mr. F. C. S. Schiller that, in spite of many attempts, he could never succeed in getting him to admit "unambiguously and consistently" that logic had any concern with telling us how we ought to think. This, however, is an extreme and over-simple view of the matter, and the truth seems rather to be that the study of logic may really be a help towards more accurate and effective thinking, but that there is no other way by which it can give us this help than by laying bare for our inspection the

[2] W. D. Ross, *Aristotle,* pp. 20 ff.
[3] *Op. cit.,* Vol. I, pp. 1–3.

principles actually operative in such thinking as we have always carried on. Yet this last point is an immensely important one; for the grossest of all philosophic errors, and the typical *idolum theatri* of intellectualism, is the notion that the logician is in possession of some independent standard of thinking with which the standards guiding our actual thinking may be *compared;* or that the moral philosopher has some more direct and 'metaphysical' means of working out what we ought to do than by thoroughly comprehending and faithfully applying the standards present in the consciousness of the ordinary moral agent; or that the student of æsthetics has hit upon his standards of beauty in some other way than by *accepting* them from his own pre-scientific æsthetical consciousness and confining his endeavours to their further clarification; or that the theologian can find some new and independent reason for believing in God instead of instructing us more clearly as to the nature of the grounds on which men have all along believed in Him. There are no other tests of reasoning, of right and wrong, of beauty, or of the truth of religion, than those which we find actually operative in our thinking, our conscience, our appreciation of beauty and our common faith. The knowledge we need is a knowledge that is native to the thinker, the moral agent, the artist and the religious subject (or shall we say the saint?) respectively; a knowledge which is communicated by these to the corresponding sciences rather than received by them from such sciences. To understand this fact and do justice to all its applications is the beginning of wisdom in the student of any *Geisteswissenschaft.*

III.

It will next be pointed out to us, however, that in speaking of logic as being concerned with "the principles actually operative in our thinking" we are guilty of a certain equivocation. For nothing could be plainer than that the principles in question are only *imperfectly* operative in our thinking. Our thought is far from being wholly determined by the 'laws of thought' and 'valid syllogistic forms' recognized by logical science. There are two kinds of thinking, valid and invalid. And it will be suggested that we have here a real means of distinguishing logic from psychology. Logic, it will be said, concerns only valid thinking; whereas

psychology is equally interested in all thinking, not discriminating valid from invalid; so that the principles which it lays down, unlike the laws of logic, "account equally well for correct thinking and incorrect thinking".[4]

This seems a more promising suggestion, yet it is still far from getting us 'out of the wood'. For, on the one hand, it is really quite untrue to say that logic does not concern itself with incorrect thinking. Beginning with Aristotle, whose *Sophistici Elenchi* is "a study of fallacy in general",[5] every textbook of logic has had at least its chapter on fallacy. I should say that, just as any true epistemology must be able to account for error (that is indeed the main test of it, as Plato knew), so any true logic must be able to account for every known kind of fallacious reasoning. Moreover it is most important to notice that the laws of thought of which logic discourses are in a real sense implied in incorrect as well as in correct thinking. All thinking *tries* to follow these laws. It is of the essence of all thinking that it at least *lays claim* to validity and self-consistency and non-contradiction. As the schoolmen put it wisely, *veritas norma sui et falsi.*

And on the other hand it is true that the psychology, no less than the logic, of reasoning (or of intellection, as the psychologists frequently prefer to call it) must concern itself with the laws of correct thinking and (consequently) with the difference between correct and incorrect thinking. When as intelligent psychologists we come to the observation of the thinking process, the very first thing we notice is that thinking is always trying to be correct, always trying to adhere to the logical laws of thought. Consequently the psychologist's first task in this region must be the so-called 'logical' one of discovering and accurately stating just what it is that thought is always trying to be. Just because the principles of correct thinking are not ideals which the logician imposes upon his facts in the light of some superior and speculatively-obtained knowledge, but rather ideals which he finds immanent in these facts themselves and actually operative in the processes of them, they are principles which cannot possibly escape the notice of the attentive psychologist; and it is certain that, until

[4] G. F. Stout, *Manual of Psychology*, p. 5.
[5] W. D. Ross, *Aristotle*, p. 59.

he notices them, he cannot even begin to understand what thinking is or how it works. There are not *two* accounts that can be given of what passes in a man's mind when he does a bit of thinking, a logical and a psychological one; but only one account. And the only way to present this account is by formulating the laws of thought and the forms of the syllogism. I have always felt that the chapter on intellection in the textbooks of psychology should mainly consist of a short summary of what is found in our textbooks of logic.

Let us come down to a particular case, to the case of a student working out the proof of the Euclidean *pons asinorum*. Clearly it is the business of the psychologist to explain the sequence of the thoughts that are passing through the student's mind, to explain, for example, exactly *why* the judgement that the angle ABC equals the angle ACB should follow in his mind on the other judgement that the angle ABG equals the angle ACF. If that is not the psychologist's business, what is? But is there any conceivable explanation that he can give, other than by appealing to the general logical (not to mention the particular geometrical) principles immanent in the student's mind? Clearly there is not; and the various attempts which have been made by 'empiricist' psychologists to give a second (and so-called 'psychological') kind of explanation have all been pitiable failures. What such psychologists have usually done has, of course, been to fall back upon 'mental association' or even 'mental chemistry', attempting to explain by merely associative laws why just *this* thought should follow on just *that* one. And even writers like James and Titchener, in spite of their general repudiation of associationism, really lapse back into its weak and beggarly elements in their chapters on 'the psychology of reasoning'. Yet on the other side one can mention names like Brentano, Natorp, Husserl, and the founders and adherents of the *Gestaltpsychologie*. All these see clearly that mental states cannot be explained in terms of their antecedents alone but only in terms of the whole *Gestalt* or pattern to which they belong; and it is clear that when the mental state in question forms a link in a ratiocinative process, the pattern concerned is a logical one, the principles of whose structure are nothing less than the laws of thought. This idea of *Gestalt* really appeared in

English psychology as early as 1896 in Professor Stout's careful distinction of what he called 'noetic synthesis' from mere associative transition. "In any given stage of a train of thought", he told us, "the next step is partly determined by the controlling influence of the central idea of the topic with which the whole series is concerned, and partly by the special idea which has last emerged. In so far as it is determined by the special idea which has last emerged, the principle of association is operative; in so far as it is determined by the central idea of the whole topic, noetic synthesis is operative".[6] Here again it is quite clear that the process cannot possibly be explained without appealing to the logical structure of mind. There is indeed *one* way of learning the proof of the *pons asinorum* which can be explained by purely associative laws, namely, the dunce's way of learning it by rote without attempting to understand the *rationale* of the thought-sequences involved. But just in the theorem of the explanation of the difference between learning by rote and intelligent ratiocinative process do we come upon the psychologist's own *pons asinorum!*

IV.

Very closely connected with this attempt to differentiate psychology by excluding from its purview the logical determination of mental process is the attempt to differentiate it by excluding from its purview the *object* of experience and permitting it to concern itself only with the experience itself. This view was defended by Ward as expanding the meaning of his statement that the standpoint of psychology is 'individualistic'. Ward's contention is that the subjectivist standpoint of Berkeley was bad epistemology but perfectly good psychology. "Of all the facts with which he deals, the psychologist may truly say that their *esse* is *percipi.*" "A psychologist *may* be an idealist in Berkeley's sense or in Fichte's, but he need not; he is just as free, if he see reason, to call himself, after Hamilton, a natural realist; only psychology will afford him no safe warrant for the realism part of it." Whether or not Berkeley was right in holding that Locke's "hypothetical outer circle" did not exist, the psychologist can take no cognizance of it. This view of Ward's is one that has

[6] *Analytic Psychology*, Vol. II, p. 3.

been followed very widely; and it has been very particularly relied upon for the differentiation of the psychology from the philosophy of religion. "Psychology", says one writer, "is concerned solely with what goes on *within* the conscious process. On this purely scientific view it is inevitable that the mind should be treated on mechanistic lines. . . . It will exclude from its purview all causes which lie outside the conscious process, and will invite us, at least provisionally, to regard mental phenomena as finding their complete explanation within the mental series. As applied to the special case of the psychology of religion, this principle involves the assumption that the psychology of religion is concerned with religious phenomena only in so far as they are factors within the conscious process, and find their explanation therein. Hence while religion itself is concerned with a spiritual world that transcends the individual, the psychology of religion must restrict itself to what goes on in the mind of the individual. . . . It is no part of its business to refer this experience to any external cause".[7]

This is a position which I have always found puzzling in the extreme, and it has long been a comfort to me to find psychologists like Stout and Natorp abandoning it completely. The difficulty is to see how, if the process of consciousness is really determined by trans-subjective objects, the psychologist can possibly account for the sequence of it without reference to these objects; or, alternatively, to see how, if the psychologist can so explain it, there can possibly be any ground for believing in a trans-subjective determination. It cannot be true *both* that the sequence of mental states is capable of a purely intrasubjective explanation *and* that it is under objective control. To say that one of these statements is true in psychology and the other in epistemology would be a modern parallel to the mediæval doctrine that a proposition may be true in philosophy while its opposite is true in theology.

Either consciousness contains a reference to a real world or it does not. If it does, then that is by far the most important fact about it, and a psychology which ignores it thereby condemns itself. "The whole object of thought", says Professor Stout, "is never merely a content of our finite consciousness";[8] if this

[7] Professor E. J. Price, "The Limitations of the Psychology of Religion" in *Hibbert Journal*, Vol. XXII (1923–1924), pp. 664 ff.

[8] *Analytic Psychology*, Vol. I, p. 45.

is true, then no fact of mind can be correctly described without reference to what is beyond our finite consciousness. For it is not merely that the object of my individual consciousness is an object in a world that is independent of my individual consciousness, but that I am conscious that it is so independent. If then I am conscious of the object as being more than a mere 'presentation' in my mind, the psychologist who treats it as only a presentation is grossly misrepresenting the very consciousness which he is attempting to describe. But in truth there exists no such thing as "a consciousness"; what exists is an animal conscious of an objective world.

V.

I come now to a fourth and last way in which the psychological standpoint is sometimes differentiated from the logical. It is said that whereas psychology is concerned with the phenomena of mentality as such, logic has no more to do with mind than has geometry or arithmetic, and deals only with "the principles by which reality is constructed" or "the most general relations obtaining between things in general". "Philosophers", writes Mr. Bertrand Russell, "have commonly held that the laws of logic, which underlie mathematics, are laws of thought, laws regulating the operation of our minds. By this opinion the true dignity of reason is very greatly lowered; it ceases to be an investigation into the very heart and immutable essence of all things actual and possible, becoming, instead, an inquiry into something more or less human and subject to our limitations".[9] "Psychology", says Bosanquet (who here at last finds a basis of distinction), "treats of the course of ideas and feelings; Logic of the mental construction of reality".[10] Or again, in another volume, "Psychical events . . . form the subject-matter of Psychology . . . Logic, again, has an entirely different sphere from Psychology in that it deals with mental events as material for the construction of reality; and its principles are not psychological laws, but principles by which reality is constructed".[11]

This view of the matter rests upon sound insight, but I feel that

[9] *Mysticism and Logic*, p. 68.
[10] *Essentials of Logic*, p. 4.
[11] *The Psychology of the Moral Self*, pp. 4–6.

the insight does not go quite deep enough. To the last-quoted sentence Bosanquet adds this qualification, which seems to me to be really destructive of the abrupt distinction which had preceded it: "But all the same a mind which is swayed by a logical principle, whether consciously or unconsciously, will differ psychologically from one which is not, or from itself when not under the influence of the principle; the mental contents will be differently organised in the two cases, and will thus afford different material for the psychologist".[12] Moreover it will be noticed that the distinction made by Bosanquet was from the beginning very significantly less sharp than that made by Mr. Russell. The latter seems to regard logic as having nothing whatsoever to do with mind, whereas Bosanquet makes it deal with "the *mental* construction of reality". This, it will be said, is because the one writer is a 'realist' and the other an 'idealist'. However that may be, it seems certain that it is Bosanquet who is here nearer the truth; for the view that the laws of logic have no necessary relation to mind or thought or knowledge is as contrary to common sense as it is novel in the history of the subject. Furthermore, it is necessary to insist that it is not proper for logic, any more than for psychology, to attempt to arrive at the principles by which reality is constructed in any other way than by the careful interrogation of our ordinary consciousness of them; and that that logic will be most successful and most true which is able to enter most fully into the actual psychological reality of the reasoning process itself—an ideal to which Bosanquet's own logic possibly approaches as closely as any other. And of the normative sciences the same thing is true. The laws of morality are indeed realities independent of our finite minds, yet it is only by the painstaking analysis of our finite consciousness of them that their nature can be discovered—and not, as too speculative moralists have fondly hoped, by some separate process of a purely deductive kind. This is the fundamental principle of the Socratic method, and the dialogues of Plato are so many monuments to its truth.

Then, on the other hand, I should claim that not even in psychology are we ever properly dealing with "our own subjective consciousness as such", but rather with our consciousness in what

[12] *Op. cit.*, p. 6.

is the one true view of it—as bringing us into relation with an objective order of things. It is just out of this attempt on the part of so many psychologists of the last generation to substantiate our subjective consciousness as a thing existing in its own right and, as it were, *alongside* of the objective order, that the behaviourists have been able to make such excellent capital for their own opposite and even more one-sided view. According to a writer like Ward there seem to be three entities concerned in any act of knowledge—the subject, an 'idea' or 'presentation' in his mind, and an object to which this presentation is referred; and it is only with the first two of these that psychology has to deal. But surely the 'presentation' is not an entity in its own right at all. A state of consciousness is not a *thing;* it is only a *knowledge*—a knowledge of something other than itself; and apart from that of which it is a knowledge it is meaningless and even non-existent. "Psychology", says Bosanquet, following Bradley, "has to do with psychical occurrences and their laws".[13] But the only 'laws of mind' are the laws of the reality known by mind. There are no separate 'psychological' laws by which the process of knowledge is guided. And, as a matter of fact, there is nobody who has more impressively insisted on this fact than just Bosanquet himself in his later writings. This is how his teaching is summarised by Professor Hoernlé: "It follows that the so-called 'laws of mind', from the laws of association to the laws of logic, are laws which state how what a given mind apprehends here and now determines what it goes on to apprehend next. In other words, they are laws which formulate the nature of the Real as controlling the sequence of what a given mind thinks, and determining, as 'conclusion' in theory, or as 'decision' in conduct, what the mind accepts as true or as right. Thought, in a word, 'is the control of the mental process by the real object'. . . . A creature's 'world' . . . is that portion of the total Universe, that 'cross-section' (so to speak) of it, which is defined by the creature's selective purposes. But what else is the creature's 'mind' except this selected portion of the Universe?"[14] But I have nowhere seen the matter more clearly set forth than in Professor Hoernlé's

[13] F. H. Bradley, *Mind*, O. S. xii, 354; Bosanquet, *Psychology of the Moral Self*, p. 4.

[14] *Idealism as a Philosophy*, pp. 240 ff.

own writings. "Obviously", he says in one place (this time speaking for himself), "we cannot separate the character and mainsprings of mental activity from the character of the 'contents' or 'objects' upon which that activity is exercised. . . . Our minds are microcosms, drawing all that is included in the range of their awareness from the macrocosm of the Universe. And their activity and life is the activity and life of the Universe in them".[15]

The behaviourists seem to me to be right in their refusal to regard our states of consciousness as separate realities existing *alongside* the objects of which we are conscious; but of all the ways out of this dualism they have chosen the least promising—the way of dogmatic materialism. The only true way to escape from it is to rise to a conception of reality in which the objects we know and our knowledge of them are seen to be equally authentic sides of what is ultimately one and the same thing. It is true that in our knowledge a certain duality is always present, but the more we reflect upon its nature, the more we come to see that it is not fundamentally a duality of mind and its objects, of knowledge and reality, but rather a duality between finite and infinite mind, between reality imperfectly known and reality perfectly known. Perfect knowledge means a mind which completely conforms to the objects it attempts to know, whose law is the law of the objects known, and between which and its objects we are consequently aware of no dualism to be bridged. So, as Aristotle long ago pointed out, "the divine thinking will be one with the object of its thought (*καὶ ἡ νόησις τοῦ νοουμένου μία*)".[16] The only reason why we are commonly aware of a discontinuity between ourselves and reality is that our grasp of reality is so imperfect.

And now there is another point to be emphasised. We saw above that the only laws of mind are the laws of the reality known by mind, and that there are no separate 'psychological' laws by which the process of knowledge is guided. This does not mean, of course, that the laws of reality are always in complete control of the process of knowledge, which would mean that knowledge was always adequate to its object. But it *does* mean that knowledge is always *endeavouring* to be adequate to its object, and that

[15] *Idealism as a Philosophy*, pp. 74 ff.; *cf.* also *Matter, Life, Mind and God*, Ch. IV, "The Function of Mind".

[16] *Metaph.* 1075*a*; W. D. Ross's translation.

we shall never understand how it works by trying to discover in its behaviour dead uniformities that can be explained without reference to the objective reality to which it is endeavouring to conform, but only by discovering just what this reality is. Mind is essentially purposive;[17] its movement can never be explained otherwise than teleologically, *i.e.* in terms of what it is trying to be. As Aristotle has it, *τὸ πρῶτον οὐ σπέρμα ἐστίν, ἀλλὰ τὸ τέλειον*[18] —"a process of development is to be accounted for, not in terms of the seeds from which it starts, but in terms of the ideal at which it aims." Hence there are no *natural* laws of psychical occurrences —in the sense of observable uniformities—but only *normative* laws; and these it is the task of the *Geisteswissenschaften* to lay bare. It follows that there is no real place, alongside the normative sciences of logic, æsthetics, ethics and theology (or the philosophy of religion), for a parallel group of merely 'psychological' sciences which pretend to regard mental phenomena in a merely 'existential' way, as mere 'occurrences', and to explain them 'mechanistically', under the name of the psychology of reasoning, of art, of morals and of religion respectively. Our moral and religious experiences, for example, are teleological series, consisting essentially of value-judgements, and there is no other way, 'psychological' or otherwise, of explaining these series and accounting for the sequence of them, except by investigating the precise nature of the valuational norms which they employ. "The primacy of the normative"[19] is but another name for the essentially teleological character of mind.

[17] This is denied by no competent psychologist. "The pursuit of future ends and the choice of means for their attainment", says James, "are the mark and criterion of the presence of mentality" (*Principles of Psychology*, Vol. I, p. 8). And so also Wm. McDougall, *Psychology, the Study of Behaviour*, p. 20.

[18] *Metaph.* 1073*a*.

[19] I borrow the phrase from Emil Brunner, one of the philosophical representatives of the new Barthian movement in Germany. So far as the case of religion is concerned, I have gone into this matter very fully in my book, *The Interpretation of Religion*, pp. 132–147, and need not here repeat myself. Instead of that I shall offer a rough translation of an admirable passage from one of Brunner's books. "It is a very serious error", he writes, "—though it is one almost everywhere current among psychologists—to suppose it possible to discover and describe 'objective values' (*i.e.*, judgements claiming validity) in a purely empirical manner and without committing oneself to an acceptance of their objectivity or validity. This failure to understand the *primacy of the normative* over the merely matter-of-fact is the core of psycho-

A very few words will suffice to indicate the conclusion to which our discussion has seemed to lead us. If there be such a science as psychology, its subject-matter must, *vi termini*, be the human soul or mind. But the distinguishing characteristic of such mind is "the manifestation of purpose or the striving to achieve an end"; [20] and thus psychology might be defined as the science of

logism; which may indeed be defined as the assumption that factuality is the all-determining category and that the normative attitude is only possible on the basis of a prior stock-taking of empirical facts. This widely-diffused error lies at the root of such opinions as Wobbermin's, that 'there is no other way of making our actual thinking intelligible than the way of psychological analysis.' Rather is it true, on the contrary, that nobody can ever have even the faintest notion of what an act of thinking is, who looks at it in a merely psychological way, from the outside, and without recognition of the logical laws inspiring it. Only on the basis of a recognition of the normative as such can there ever be a psychology of thought and of mental life in general. On any other terms there will be lacking from the description the one essential factor, namely the fact that 'objective values' are independent of the context in which they are discovered, that they are immediately recognized as universally valid, and that the understanding of them and the recognition of their compelling validity are one and the same mental act. Nobody knows what logical compulsion is who does not acknowledge its right. There is no psychology of thought without logic—the normative science of thought. For it is only the normative laws of logic which can explain why the thinking being does that which he does when he thinks. He who either does not know or does not acknowledge these logical laws can as little understand and describe intelligence, as a man ignorant of music and its system of scoring can understand or describe the behaviour of an orchestra. Psychology comes up against its limit in the teleological character of mind. The behaviour of mind is not to be understood, like the events of nature, by reference to efficient causes, but only by reference to *causae finales;* just as the order of words in a sentence is not to be understood by reference to the mechanism of speech, but by reference to the sense intended to be conveyed. Whenever a man thinks, the logical *posterius* follows as a matter of fact from the logical *prius;* and it so follows from it only because it *is* the logical *prius;* not, therefore, according to any kind of causal associative laws, but, on the contrary, just because the associative mechanism has been put aside by the spontaneity of the intelligence. This, however, is as much as to say that the valid, regarded as valid and as exercising the compulsion which its validity implies, takes its place in the causal series. The logical ground becomes at the same time a cause, the Finis becomes a final *cause,* just as somehow in the soul of the artist the idea is a directive agency prior to, and controlling, the individual mechanical acts that are the immediate causes of the completion of his work. For these reasons the dream of a purely mechanical and descriptive, 'objective' and impartial psychology of mentality must be taken to rest upon a radical misunderstanding of what mind really is" (*Erlebnis, Erkenntnis und Glaube,* 2 und 3 Aufl., pp. 45 ff.).

[20] W. McDougall, *loc. cit.*

purposive striving. The aim of all science is to understand; how then can psychology go about to understand the purposive striving of which our finite minds consist? There is only one way—by discovering what it is that we are striving after, by bringing to light the ultimate norms to which our thought and action are forever endeavouring to conform. This, however, is just what is done by logic, æsthetics, ethics, theology.

It follows that these normative sciences are the very soul of psychology. Are they the whole of it? Is there anything left for the science of mind—*i.e.* of purposive striving—to do, after it has told us precisely what it is that is being striven after? Well, it might try to tell us why we so often fail, or rather never completely succeed, in achieving the object of our striving; and it might try to classify these failures in some scientific way. Yet, as for this latter, the infinite formless chaos of our failures cannot possibly be classified in any other way than according to the nature and extent of their deflection from the norm; and such classification the logicians have always offered us in their appended chapter on the fallacies and the moralists in their appended chapter on the vices or sins.

When all is said, however, we do seem to be left with a certain duality. On the one hand there is the end for which we are striving, the norm to which we are endeavouring to conform, the ideal that beckons to us from beyond; and on the other hand there are our weak and limited and sinning human selves, whose glory it is that we strive, whose sorrow and shame it is that we lag so far behind. In dealing with the former we are not dealing with ourselves at all, but with 'Infinite Mind', 'the Absolute' or 'God'—let us choose the name according to our light. In dealing with the latter we are dealing with our own finite mentality. This, then, is the real distinction that lies behind our confused modern dichotomy of logic and psychology—the distinction of finite from infinite mind, finite from infinite knowledge, finite from infinite beauty, finite from infinite goodness. And this, clearly, is a distinction which must not be interpreted in the sense of a radical discontinuity. The facts are too complex for that. As Bosanquet used to say, the real truth about our minds is not that they are finite, but that they are "finite-infinite"—with a reach exceeding

their grasp; so that the distinction is not really between finite and infinite, but between finite-infinite and infinite. There is no radical dichotomy of end and striving, because the end indwells in the striving. There is no radical dichotomy of divine and human, because the divine (in spite of its transcendence) indwells in the human. Nor is there any other way of explaining our human experience than as the progressive invasion of an originally animal nature by a higher order of reality which itself exists eternally in changeless perfection.[21]

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[21] In writing this paper I have been deeply conscious of the debt I owe to a course of lectures on psychology by Mr. Henry Barker of Edinburgh University, to which as a student I had the privilege of listening. But the responsibility for the outcome must of course lie upon myself alone.

CAUSATION AND THE GEOMETRIC METHOD IN THE PHILOSOPHY OF SPINOZA (II).*

TO determine the causes of things, then, the true method will seek the causes of ideas. Its tests are concerned with ideas and their characteristics, and the order of its inquiry is an order of ideas. The inquiry will be satisfied, finally, not by some historical explanation of forces or events, but by a generation of the idea or the essence from a principle which does not in turn require explanation or cause.

> The true method is the way in which truth itself or the objective essences of things or ideas (all three have the same significance) are sought for in the proper order. Again the method must necessarily touch on reasoning and understanding; that is, the method is not the reasoning itself to understand the causes of things and far less is it the understanding of the causes of things; but it is the understanding of what a true idea is by distinguishing it from other perceptions and by investigating its nature that we may thence know our power of understanding and that we may thus accustom our mind to understand by that standard all things which are to be understood.[16]

The manner and the locus of the method are, therefore, unambiguously specified. True, its basis is yet to be stated, and one might have reasonable doubts whether, or at least in what sense, the idea is under the same conditions objectively as the ideatum is in reality. Yet the supposition is that an examination of method may bring out the aspect of the understanding or of nature which will justify even that confidence.

The nature of the causation among ideas is not difficult to state. Any relation of ideas is a causal relation. For a thing to have relations or intercourse with other things is for it either to produce them or to be produced by them. The question suggested is concerning ideas and things: how are the connections of an idea with other ideas the same as the relations of a thing with other things? This question Spinoza asked and answered in different terms and in a different context than these. Possibly, if the *Improvement*

* The first part of this article appeared in the March, 1930, issue of this REVIEW, p. 178.

[16] *Int. Emend.*; II, 15.

of the Understanding had been completed, it would have approached the question in the order in which it has turned up here, but in any case developments in the history of thought since the seventeenth century justify asking the question thus in his name, particularly since his treatment of method indicates that he thought it could be disposed of easily and should become, apart from metaphysics, an irrelevant question. It is not an impossible hope, therefore, that an examination of his method may show how the question disappears. To answer the question will, of course, lead back to Spinoza's language and to his order of consideration, for in the inquiry into the nature of the understanding, as in all inquiries, knowledge of effect is nothing other than the more perfect knowledge of cause, and if the cause of the true method is sought, the starting-point must be a more perfect knowledge of the nature of the understanding and eventually of God.

A simple idea, then, one which has no relations with any other ideas, is necessarily true. Aristotle would have said that a simple idea is neither true nor false, but in the context of their systems the consequences of the two statements are the same: a simple idea cannot be investigated; questions of truth or falsity are improper to it. Any definition moreover is necessarily true. In his letters Spinoza states as an axiom which a philosopher should know that *every definition or clear and distinct idea is true.*[17] That this is essentially the aristotelian distinction is clear from another letter in which the meaning of the word definition is broadened to include the description of an existent and real thing outside the mind.[18] If the definition explains a thing as it exists outside the understanding, it is no different from a proposition, and it differs from an axiom only in that it deals with the essence of things or of conditions, whereas the axiom is wider and extends to eternal truths. Like a proposition too such a definition must be shown to be true. On the other hand a definition may explain a thing not as it is outside the mind, but as it is conceived or may be conceived by the mind. In that case it differs

[17] *Epistola IV;* IV, 13. In the *Organon* Aristotle speaks of simple ideas as neither true nor false (*De Int.* 16[a] 10; *cf. Meta.* Book E, 1027[b] 27). Elsewhere they are considered to be necessarily true (*Meta.* Book Θ, 1051[b] 31, 1052[a] 1; *De An.* Book III, 430[b] 28).

[18] *Epistola IX;* IV, 43.

from an axiom or a proposition, since all that is required of it is that it be conceived, whereas an axiom must be conceived as true. Spinoza illustrates this distinction: if one says that each substance has only one attribute, that is a mere assertion and needs demonstration. But if one says that by substance one understands that which consists of only one attribute, that is a good definition, but thereafter one must be careful to call entities consisting of more than one attribute by some other name than substance.

In the second sense of definition it can be said that all definitions (and, what is the same thing, all clear and distinct ideas) are necessarily true. Unless the definition is thrown in a form in which its references carry beyond the understanding (and in that case it is properly a proposition), the very statement of the definition is mark of its truth. Once more this is a distinction between the extrinsic and the intrinsic marks of truth to the end that method may deal exclusively with the latter, for only the intrinsic qualities by which a true idea is known as adequate can be recognized by the method. The distinction to this end is recurrent in the *Improvement of the Understanding.*

> For with respect to that which constitutes the form of the true, it is certain that true thought is distinguished from false not only by extrinsic but principally by intrinsic denomination. For if a workman conceives some construction in proper order, although such construction never existed nor even will ever exist, nevertheless his thought is true and is the same thought whether the construction exists or not; and if on the other hand some one says that Peter, for example, exists, and yet does not know that Peter exists, that thought with respect to him, is false, or if you prefer, is not true, although Peter really exists. Nor is the proposition, Peter exists, true except with respect to him who knows certainly that Peter exists. Whence it follows that there is something real in ideas, by which the true are distinguished from the false.[19]

Save in the case of an idea which has explicit existential references, the truth of the idea of an existent thing is no different from the truth of the same thing nonexistent. The mark of the true idea is that the properties of the thing may be known from it, not that something may be known to correspond in some sense to it in nature.

At the bottom of this notion of truth is the realization that the knowledge of things cannot be equated to particular things. It

[19] *Int. Emend.;* II, 26.

should be possible to recognize the particular thing from a clear idea of it, but the problem of whether there exists some thing to which a given definition fits is the problem of the special scientific techniques, not properly a problem of logic. If the properties which flow from the definition are not the properties recognized in the thing, the definition, although true, is not there applicable. To say therefore that every definition or every clear and distinct idea is true, is not to insist that every assertion of the mind is applicable wherever the mind wishes, but rather that if the mind understands its assertions, it will recognize when they are true or false. Consequently, the principle of choice among the possible definitions of anything is, of course, first to choose definitions from which the properties of the thing in question are known, and then, since there will be an indefinite number of such definitions, to seek that definition from which all the properties of the thing are most readily deducible. From any definition and from axioms (recognized immediately to be true) properties can be deduced (indeed, Spinoza was convinced, despite the objections of one of his correspondents, that more than one property could be deduced from a single definition),[20] and any falsity consequent to wrongly applied definitions must reveal itself in the very process of deduction. There are no dangers in the combinations of ideas; statements and propositions may even be fictitious without being false. It is important of course that the idea be perceived clearly and distinctly; if it is so perceived any false fiction will be detected at once, since its consequences will run counter to the consequences of the clear idea. Fictions can be indulged in only when they are not seen to involve impossibility or necessity; if they involve the one they are seen to be false, if they involve the other they are seen to be true, and in either case they cease to be fictions.

As distinguished from truth, then, fiction is an unwarranted or at least an unexamined association of ideas. If causes are found for any connection of ideas, their connection is seen to be proper in terms of the cause that brings them together. Thus if motion is affirmed of a semicircle the affirmation is false. Yet if a conception of a sphere is formed by feigning a semicircle revolving about its diameter, that is a true idea, and in it motion

[20] *Epistola LXXXVIII;* IV, 335. *Cf. Epistola LX;* IV, 271.

is affirmed properly of a semicircle. The conception of the sphere is then the cause of the conception of the motion of the semicircle. Falsity in all cases consists only in affirming one thing of some other thing which is not contained in the conception which had been formed of the latter thing. Far from avoiding fictions, therefore, the true method indicates that they are proper and may lead to the truth, provided only the conception of the thing be clear and distinct.

It might appear however, since all definitions are equally true, though not equally useful or productive, that there is no distinction possible between fiction and truth. One fiction, it might seem, is limited, not by truth or by the understanding, but only by another and contrary fiction. The mind would then encounter nothing fundamental in either nature or thought, but would be free to construct its own systems with no other limitation than that one fancy might contradict another; and even in such a case it would be free to choose between the contrary fancies. This doctrine Spinoza conceives to be a total denial of understanding; his refutation of it consists in pointing out the difficulties and absurdities of such a denial; these are apparent to *us who know that we know something.* Those who deny it

> say that the soul can feel and perceive in many modes, not itself nor things which exist, but only things which are neither in themselves nor anywhere, that is, that the soul can by its own force create sensations or ideas which are not of things, for they regard the soul as God in part. Moreover they say that we or our soul have such liberty that we or our soul constrain our own liberty: for after it has feigned anything and has given its assent to it, it cannot think or feign it in any other way, and it is further constrained by that fiction so that even other things are thought in such a manner that the first fiction is not opposed, just as they are constrained here to admit because of their fiction even the absurdities which I have here enumerated; we shall not be wearied by exploding them with any demonstrations.[21]

Yet this confidence that reason deals with the natures of things and not only with fictions seems to suggest to Spinoza, once it is stated, the danger that to state it thus may seem to give it little foundation, and possibly for that reason he appends a footnote which carries back once more to the nature of the understanding.

> Although we may seem to conclude this from experience (and who will say that that is nothing?) because a demonstration is lacking, if any one desires

[21] *Int. Emend.*; II, 23.

it, he may have it as follows. Since there can be nothing in nature which is contrary to its laws, but since all things are made according to certain laws of nature, so that they produce their certain effects by certain laws in irrefragible concatenation, it follows hence that the soul, when it conceives a thing truly, proceeds to form the same effects objectively.[22]

Our inquiry again, therefore, if we would know the distinguishing mark of truth and fiction, is into the nature of the mind by which certain ideas are recognized as its proper consequences and therefore true, and by which the absurdity of others is recognized by deductive analysis. There are some things concerning which false fictions are impossible; what they are may be known, if not ultimately, at least proximately, from the nature of the understanding. The metaphysical foundation of this confidence is easily discovered in the spinozist system: it is the nature of the thinking being to form true and adequate ideas; but as thinking beings we are part of a thinking being, therefore some ideas arise in us which constitute our mind only in part; those ideas are inadequate, the result of the impress of external things upon us, the product of experience; the true method will avoid them and confine itself to ideas which arise from our mind alone and constitute it, not in part, but as wholes. This metaphysical basis, even though it may still seem unacceptable, makes somewhat clearer the mechanism of the method.

The mind, when it considers a thing which is fictitious and false to its own nature so as to ponder it and understand it and to deduce from it in good order such things as are to be deduced, will easily make manifest falsity; and if the fictitious thing is true to its nature when the mind considers it to understand it, and begins to deduce from it in good order such things as follow from it, it will proceed happily with no interruption, just as we saw that from a false fiction, in the manner stated, the understanding was immediately led to show the absurdity of it and other things deduced from it.[23]

There is nothing mysterious in this power ascribed to the mind; if a thing is understood it makes itself evident, and no other proof is needed, only an example of it. Similarly a contradiction need only be pointed out to appear false.[24] However the mind may be led to a truth or a falsity, there must be that in the ideas or the demonstration which it recognizes as true or false. The founda-

[22] *Int. Emend.*; II, 23, note a.
[23] *Int. Emend.*; II, 23–24.
[24] *Int. Emend.*; II, 20, note s.

tion of the true method, Spinoza is convinced, is in the statement of what there is in ideas by which some are recognized to be true, others false. This does not mean that there is an absolute truth to be determined concerning existent things, nor does it preclude the possibility that a given object be understood in many ways, that a variety of definitions be feigned for it. But it does involve as a consequence that there are implicated in the processes of the mind, and discoverable by it, some eternal truths. We can feign various causes for a given thing, but those feigned causes must involve an uncaused principle, such as motion or thought, or behind them God. The consequences which follow from these uncaused principles are eternal truths; there is for example the first and eternal truth that God is, but it is not an eternal truth that Adam thinks; it is an eternal truth that a chimera is not, but it is not an eternal truth that Adam does not think.[25]

Certainty is founded therefore on the circumstances that the materials of thought, the simple ideas, cannot but be true, and that the mind may know eternal principles according to which the combination of ideas must be true. If an idea is very simple it must be clear and distinct and therefore true; if on the other hand it is made up of a combination of distinct ideas, their composition must be clear and distinct and therefore true, for the elements and the cause of the composite idea are known. Certainty, Spinoza says, is nothing else than the objective essence; it is the way in which the formal essence is perceived. Therefore no other sign of certainty is needed than to have the true idea, since it is not necessary to know that we know.[26] In this sense the mind has the power to know true ideas. To define a thing in a given way is not to penetrate into some hidden recess of nature, but simply to state the characteristics or the properties by which the thing may be recognized; if the definition is clear the nature of the thing and its properties must be clear too. If that is the case it will appear clearly from the analysis of the definition; if they are false the falsity will appear in the same way. There is between thing and knowledge the legitimate distinction of that which a thing is and that which it must be to be just that thing. The first

[25] *Int. Emend.;* II, 20, note w.
[26] *Cf. Int. Emend.;* II, 15.

is difficult, not to say impossible, to express discursively, since it is the infinitely complex, unique nature of the thing; the second is the statement in discourse of the form of that nature, and if the statement is successful the manifold characteristics of the thing may be evolved deductively from it. Medieval philosophers saw this difference in the distinction between the *formalitas* and the *intentio* of the thing. The thing obviously is what it is, dependent on its constitution and the forces and things which environ it; but no less significantly is it derived from and dependent on the truth which is the statement of it. On one analysis the cause of a circle is the compass and the motion of the compass which drew it; on the other its cause is the definition from which its properties may be known. Spinoza's confidence in his method is a confidence simply that these two causes do not refer to different natures. Even more, the reduction of efficient causation to the causation of ideas has the effect of removing from consideration the chain of temporal events which is most usually indicated in efficient causes. The efficient cause of a thing becomes in Spinoza's system that from which the nature of the thing might conceivably have proceeded, not the complex of events immediately antecedent to its production. The latter could never be known exhaustively or adequately, whereas once the nature of the thing is known, however it may come to be known, all possible qualities and all possible effects can be known from it. Therefore even events of time and space, so far as they can be known, are intelligible from the nature of things which the mind can know adequately, not from histories which must be partial and incomplete.

This analysis of human thought is at once sound and suggestive. It is even questionable only at one point, and at that point of course the characteristics peculiar to the spinozist method are developed. That point has already appeared in various forms in this statement of the method: it is the confidence that the objective essence conceived in the mind corresponds to the formal essence of the thing; this may be derived as the consequence of eternal truths which are known certainly; and these truths in turn may be recognized because of the fixed nature and definite laws of the understanding. It is not, in any case, the bland assumption of a parallelism or a correspondence of idea and thing. The difficulty is rather in

showing that an infinite regress in ideas is impossible and that fictions are limited by the understanding, not by other fictions. But the demonstration of this or any of the fundamental properties of the understanding seems to forfeit the position, since it would bring out the nature of the understanding by means of something else, whereas the nature of the understanding should be at the bottom of our acceptance of the demonstration. That this is the case is of course no refutation of the method, but rather the reiteration that, if the method is the true method, it is impossible properly to prove it. Spinoza recognizes the difficulty in almost these terms. He remarks the incongruity that he should have demonstrated the method by reasoning, for this would indicate that it is not self-evident, and questions might be raised therefore concerning the correctness of the reasoning.

> If we reason well we must begin from a given idea, and since to begin with a given idea requires demonstration, we ought again to prove our reasoning, and then again prove that reasoning, and so to infinity. But to this I reply that if some one had by some chance proceeded in investigating nature as follows, that is, by acquiring other ideas according to the standard of a given true idea in due order, he would never have doubted of its truth, inasmuch as truth, as we have shown, makes itself evident, and all things would have flowed freely from it.[27]

The aim and problem of the method may therefore suffer a final translation. The aim is primarily to have clear and distinct ideas, and these in their metaphysical status are ideas which arise from the mind alone and not from the fortuitous movements of the body.

> The form of true thought must be placed in that same thought itself without relation to any others, nor does it recognize the object as cause, but must depend on the power and the nature of the understanding. . . . Wherefore that which constitutes the form of true thought must be sought in the form of that same thought itself and must be deduced from the nature of the understanding.[28]

A good method is one which will show how the mind must be directed according to the standard of a true idea. Obviously there may be more than one system deduced according to the good method. There is therefore a step beyond that good method; there is a perfect method, which shows how the mind must be directed not according to the standard of a given true idea but according to the standard of the given idea of the most perfect

[27] *Int. Emend.*; II, 17.
[28] *Int. Emend.*; II, 26–27.

being.[29] This perfect method advances from the statement that the mind has a true idea to the further statement that the mind may arrange and connect ideas to reflect objectively the formality of nature, not only as parts but as a whole. When it does that it reduces all ideas to one idea. The demonstration of the nature of God follows from the examination of the understanding much as the characteristics of the understanding emerge from an examination of ideas. Ultimately, by this approach, God must be because the mind is able to derive conclusions from particular affirmative essences by forming true and legitimate definitions.

This sequence which leads to the perfect method is more surprising to modern ears perhaps by the terms it uses than by the consequences it entails. Possibly, therefore, since the method leads to God as cause, or to the idea of God, the paradox of the result will be dulled if, as we learned the nature of the understanding by considering its properties, we examine the properties of this most perfect being to discover his nature. To begin with, his definition must be stated in terms of his cause. Our best conclusions, we found, are arrived at from the definition of a particular affirmative essence, and the best definition is one which states the cause of the thing. This is true in the case of the definition of God.

> So also when I define God to be the supremely perfect being, since this definition does not express the efficient cause (for I conceive an efficient cause as internal as well as external), I shall not be able to deduce all the properties of God from it; but when I define God to be the Being, etc. see Definition VI, Part I of the Ethics.[30]

The definition of the *Ethics* therefore, *By God I understand a being absolutely infinite, that is, a substance consisting of infinite attributes, each of which expresses eternal and infinite essence,* is the statement of the efficient cause of God. All the truths of the universe and of the mind follow, in a sense, from this definition; but it is equally important that existence is involved in it. Once the nature of God is known I cannot feign that he exists or does not exist, any more than, once I know I exist, I can feign that I exist or not, or any more than I can feign that an elephant can go through the eye of a needle.

[29] *Int. Emend.;* II, 16.
[30] *Epistola LX;* IV, 270–271.

The existence of God is a consequence involved in the unusual doctrine of deduction and causation which Spinoza develops. The notion, with which the analysis began, that definitions cannot be erroneous, had been possible only by separating definitions from descriptions of actual specific existent things. A definition expresses no one nor any given number of things, but only the essence of the thing as it is in itself. The definition might be recognized to apply to a given individual, but all the multitude of existing things are produced by external causes and not by the forces of their own natures, and therefore the existence of a particular thing is not concluded from its nature. On the other hand, its nature is not independent of other natures which might exist. This is a reflection of the metaphysical truth that

> besides substances and accidents there is nothing really, or outside the understanding. For whatever is, is conceived either through itself or through some other thing, and the concept of it either involves the concept of some other thing or does not involve it.[31]

The idea of substance is at the back of any existence or any idea, to be revealed by analysis; indeed the *Ethics,* working with the consequences of the concept of substance and its modifications, finds,

> we can have true ideas of modifications which do not exist, since although they do not exist actually outside the understanding, still their essence is so comprehended in something else that through it they can be conceived. But the truth of substances is not outside the understanding except in the substances themselves, because they are conceived through themselves. If any one should say, therefore, that he has a clear and distinct, that is, a true idea of substance, and nevertheless doubts whether such substance exists, it would be precisely the same as if he were to say that he has a true idea and nevertheless doubts whether it is false (as is clear enough to one who considers it carefully); or if any one asserts that substance is created, he asserts at the same time that a false idea is made true, than which obviously nothing could be conceived more absurd; and therefore it must necessarily be acknowledged that the existence of substance like its essence is an eternal truth.[32]

The investigation of concepts is pushed back among concepts until one is reached which involves no other; that is the idea of a substance which is cause of itself. The idea of God is central in the method which is according to the standard of a given true idea;

[31] *Epistola IV;* II, 14.
[32] *Eth.* I, 8, sch. 2; II, 50.

the definition of God alone among definitions must lead to his existence as a deductive consequence.

Since (according to hypothesis) necessary existence pertains to the nature of God, it is necessary that his true definition likewise include necessary existence; and therefore his necessary existence must be concluded from his true definition. But from his true definition (as I have already demonstrated from the second and third hypotheses) the necessary existence of many Gods cannot be concluded. There follows therefore only the existence of one God. Q. E. D.[33]

Without the idea of God, neither the perfect method nor metaphysics would be possible. Clear and distinct ideas are necessarily true in that they show what is implied in being a given thing, what properties, in other words, follow from a given nature. That there are or are not such things as the definition determines would be irrelevant before the consideration that if they were they would be such and such. The definition states a value for a formula, or for a function, which expresses a given nature. The mind might examine the characteristics of any constant in that formula with no inquietude over the fact that in nature no individual thing corresponding to the constant value exists. This would be enough for the true method, but there may be fundamental doubts concerning it, and against these there opens the possibility of a more inclusive method: if we know the nature of a triangle or of any idea we can be deceived concerning it only if there is something basically wrong in our understanding and its relation to nature; but we can know the nature of the whole of which these ideas are parts; the best method enables us to arrange our ideas with reference to each other as things are constituted in nature with reference to each other, not in their temporal series, but in their formal or essential natures.

Whence it follows that we can call true ideas into doubt, because perhaps some deceiving God exists who deceives us in things most certain, only so long as we have no clear and distinct idea of God; that is, if we consider the knowledge we have of the origin of all things and we find nothing which teaches us that he is not a deceiver by that same knowledge by which, when we consider the nature of a triangle, we find its three angles to be equal to two right angles; but if we have such a knowledge of God as we have of the triangle, then all doubt is removed. And in the same manner in which we can arrive at such knowledge of the triangle, although we do not know certainly

[33] *Epistola XXXIV;* IV, 180.

whether some supreme deceiver deceives us, so we can arrive at the knowledge of God, although we do not know certainly whether there is some supreme deceiver; and once we have it, it will suffice to remove, as I have said, all doubt which we can have concerning clear and distinct ideas.[34]

If this is indeed the nature of thought it accounts nicely for the paradox involved in the statement of the method of thought. For if a given idea is to be explained by its cause in the sense that the causes of ideas are formulæ or functions, and the ideas are the field of variables determined by them, obviously the cause cannot be known from the effect alone. Integration is a difficult process if no functions or only a few are known; more than one formula can usually be fitted to a given instance. Obviously then if there is a single nature of all things, related to things in this wise, nothing can be known so long as the cause of all things is unknown. But the paradox works equally well in the other direction. Nothing in nature can be understood without increasing our knowledge of the primary cause or God, for knowledge of the effect is nothing other than to acquire a more perfect knowledge of the cause.

This then is the method: there is something real in ideas by which the true is distinguished from the false; true ideas are not distinguished by the fact that true thought knows through the primary causes of things, but by a quality of the ideas themselves and by properties of the understanding; thought is said to be true when it involves objectively the essence of some principle which has no cause, but which is known in itself and through itself. The mind is a spiritual automaton which operates according to principles common to all men. It is through these principles that the understanding knows the causes of ideas; by virtue of them it is the nature of the understanding to form true ideas. The mind is enabled to go from cause to effect over the series of fixed and eternal things, which are present everywhere and which by their very widespread power are like universals or definitions of individual mutable things, as they are the proximate causes of all things. The understanding however cannot descend from universal axioms to individual things, for the axioms extend to infinity and do not determine the understanding to regard one thing more than another. Knowing God the mind knows no

[34] *Int. Emend.*; II, 30.

things but the determinations of all things. The correct method therefore is to form thoughts according to some given definition. The best conclusions, moreover, are derived from the affirmative essence of a particular thing determined in this manner. The more specialized an idea is the more distinct it is, and therefore the more clear. Knowledge of particular things is most to be sought.

The doctrine of definition and the notion of the cause of ideas give rise, thus, to a novel conception of deduction in the method of Spinoza. It is a method which cannot deal directly with individuals, nor is it on the other hand concerned with universals or classes. It is a deduction among particular affirmative essences. At one extreme Spinoza attacks vehemently the introduction of abstractions and universals into the processes of thought; at the other extreme he maintains that thought cannot be of individual changing things. Deduction is among fixed and eternal things, not among the congeries of mutable individual things. Between those two extremes lies Spinoza's method, to deduce all our ideas from physical things or real entities according to the series of causes from one entity to another. It is important that a definition by generation determines a particular, not a class; the generation of a circle must result in a circle of particular dimensions. Spinoza's criticism of universals was directed against their abstractness; the more generally existence or any quality is conceived the more confusedly it is conceived and the more easily it can be ascribed to anything. Universal or general notions are confused to an extreme degree, and Spinoza's attack upon them involves the substitution for them of definitions of particular things such that the mind may reason by particulars without ever passing over into generalities and abstractions. The true method will proceed least abstractly from the fountain and origin of nature; it has therefore no fear of deception. Its cogency rests on a single substance and on the circumstance that the idea from which it proceeds cannot be conceived abstractly or falsely.

But with respect to the knowledge of the origin of Nature, it is least of all to be feared that we confuse it with abstract ideas: for when something is conceived abstractly, as are all universals, they are always comprehended more broadly in the understanding than their particulars can exist in nature. Moreover since in Nature there are many things of which the difference is so slight that it almost escapes the understanding, it can therefore easily happen (if they

are conceived abstractly) that they are confused. But since the origin of nature . . . cannot be conceived abstractly or universally, for it cannot be extended more broadly in the understanding than it really is, since it has no likeness with mutable things, there is no fear of confusion with respect to its idea, provided we have the standard of truth (as we have already shown); this is a being, unique, infinite, that is, it is all being and beyond which there is no being.[35]

God is in this sense the origin of nature, and all things in this sense are deduced from him. He is the principle of varying things, and in him is expressed, as it were, the changeless principle by which the *natura naturata*, immutable as a whole but changing in its constituent parts, is determined. Yet the distinction between the changing things of experience, measured in time and space, known in imagination, and the fixed and eternal things which order those changing things as laws, must still be sharpened and their relation clarified. When Tschirnhaus asks whether the variety of things can be proved *a priori* from the conception of extension alone, Spinoza's answer is that it is impossible.[36] But though the existence of the individual thing is not known by deduction, and though its nature can be known from definition and from axioms alone, there is a sense in which all natures are deduced from God. A body may be known through its cause, not in the naturalistic sense, but in terms of a metaphysical and logical causation; it may be perceived as generated by the motion of a plane, and the plane in turn as generated by the motion of a line, and the line by the motion of a point. The deduction of line, plane, and body is from motion, and motion is perceived only if quantity is perceived.[37] From quantity, consequently, not body in general nor on the other hand any individual changing body, but a particular body of definite nature and defined proportions may be deduced by supposing a cause. Bodies so defined follow in the series of "physical things and real entities" from which all our ideas are deduced.[38] By them any individual body which fits the specification of that eternal thing is known. It is thus in fact that knowledge of things is possible; things are not known adequately by their experienced particularity, nor by a general

[35] *Int. Emend.*; II, 29.
[36] *Epistola LXXXIII*; IV, 334.
[37] *Int. Emend.*; II, 39.
[38] *Cf. Int. Emend.*; II, 36.

definition which specifies only a type in which they may fit more and more vaguely as the type is made more and more general, but rather by generation from a principle, like quantity, which has no cause.

The spinozist deduction is not by a logic of classes, nor even of relations in a general sense. It attempts to follow the series of entities generated by principles or of ideas dependent on ideas which are known absolutely. The idea of quantity, for example, is known absolutely, since the mind forms the idea of quantity without considering other thoughts; it forms the idea of motion having considered the idea of quantity. Quantity itself therefore can be conceived in two manners: absolutely or as determined by a cause. If it is conceived in terms of a cause, as it is in the above deduction that it might be the cause of body, it is then a determined quantity, and its cause serves only for the determination of quantity. If quantity were not conceived, prior to determination, motion which depends on it could not be conceived. The infinite nature of quantity moreover is indicated by the fact that motion can be conceived prolonged infinitely. So there are principles of things which underly any particular development or system of things, as quantity underlies any particular system of mensuration. To assert that the truth of a measure depends on quantity, is not to say simply that abstractly considered all measures are quantitative, but rather that there is a single and identical foundation of all measured series, and any particular one is only an example of it. It is not, moreover, to erect any series as the undoubted truth, but to indicate that there are properties which must be known if its truth is even to be considered. At best quantity itself will be known as a function which can generate more systems than will ever be exhausted; but if any of the systems is known, it will be in terms of the property which is known in knowing its function. The best knowledge cannot begin with isolated examples, but must seek the generative principle which will account for all examples.

Much that has been urged in criticism of the deduction of the *Ethics* is not relevant if this is its principle. Viewed superficially the subject-matter of the *Ethics* shifts with each part, and there should be no proper inference from the propositions of one to

the demonstrations of the others. The First Part treats of God, the Second of the mind, the Third of the emotions. Indeed, as if to lend confirmation to this objection, new definitions are introduced in all except the Fifth Part, and new axioms in all except the Third; and in the latter two postulates are introduced. However, since God, or rather the attributes of God, are the causes of body and mind, and since they in turn are the causes of adequate and inadequate ideas which are not different from the emotions, the deduction, though unaccustomed, is precise and warranted. It is not the occurrence of an individual body and an individual mind, nor is it the danger and the history of emotions, which is explained, but what body is and how all bodies are determined, and what the essence and the control of each of the emotions may be. It is proper that axioms and definitions be introduced in such a deduction. If quantity is an eternal principle known absolutely, the deduction of body is not from it alone; rather motion and a point are introduced, and by them the world of bodies may be known from the concept of quantity. So if God is an absolutely infinite being, one whose essence involves existence, the differentiations of beings whose essences do not involve existence, but whose existences follow from the first essence, cannot, notwithstanding that dependence, be known from God alone. If God is known, man is not therefore known; but man can be known adequately only if God is known; and if man and God are known, the relation of body and mind, the origin of adequate and inadequate ideas, the control of the passions, and the manner in which they may be made to form the smallest part of the mind, are all perceived in the best manner and by the true science.

The sequence and the manner of the deduction of the *Ethics,* no less than the introduction of axioms and definitions, can be explained by this notion of causation. The propositions of the First Part, concerning the existence of God, his unity, the freedom and necessity of his actions, and the dependence of all things on his absolute nature or infinite power, follow surely enough in deductive sequence from its definitions and axioms, even if the causal relations of ideas be ignored. Part Two, likewise, concerning the nature and origin of the mind, does not depart from the ordinary geometric manner, although without the spinozist

interpretation the relation of its deductions to those of the First Part is not clear. The Third Part, on the origin and nature of the emotions, is further removed from the ordinary conception of linear deduction, until finally in the Fourth and Fifth Parts, the deduction seems to be only the enumeration successively of characteristics of emotions and understanding, and there is little proper use of geometric demonstration; instead there is an expansion of characteristics, an exhaustion of possibilities of combination, a statement of ways in which the understanding can control the passions, and a series of discrete propositions concerning the free man and the emotions. If, however, the method is viewed not simply as geometric, but as a tracing of the causal series of ideas, the early books of the *Ethics* are employed properly in laying down the main characteristics of the causal dependence, for knowledge of effect is nothing other than knowledge of cause. Thereafter the chief end of the knowledge of God's effects, of ideas and bodies, is the exhaustive knowledge of their properties. Their properties are to be known by examination of them among causes, ideas among ideas, and bodies among bodies, for any such relation is a causal relation, and the deduction of properties proceeds best by setting the thing defined and to be investigated successively among varying causes. The identification of efficient and proximate cause, instead of removing efficient causation, as an aristotelian would have conceived it, from the consideration of science, absorbs it in the nature of things and in what Aristotle would have called formal causes; for the history of bodies impinging on bodies and of minds conceiving ideas is handled adequately only in terms of the natures of bodies and ideas. To know truly what a thing is, is to know how it is made. The properties of God are deduced directly from his nature; the properties of other things are deduced according to the standard of the idea of God. The method therefore, despite its apparent shift, is constant throughout the *Ethics*. Even more, since efficient causation is absorbed in the definition of essences and since in each case the essence is considered in terms of its cause, the dynamism so characteristic of Spinoza's metaphysics is proper to his method. The *Ethics* raises the question not only of the absolute nature of God, but of his infinite power, not only of the nature of the mind and the emo-

tions, but of their origin; the essence of a thing and its *conatus* are identified; the strength of the emotions and the power of the understanding are opposed and compared. Yet it is by natures and by definitions that strengths and forces are measured and balanced.

With this subsuming of efficient causes under essences, a reconsidered theory of experimentation becomes necessary. Spinoza's pertinent criticism of the empirical scientist of his day should not be made to obscure the very important place experimentation had in his system. Obviously, from the context of the system, experience can teach us the essences of no things, but it does turn the understanding to reflection on certain essences rather than on others. It is important to science, for example, that the histories of various elements and various fluids be stated, not that thereby their natures may be known, but rather that the general principles of nature may be applied to these instances. Clearly Spinoza intended to work out this theory, which he adumbrates frequently, in the *Improvement of the Understanding,* but unfortunately that part of the treatise was never written. He writes,

> Before we undertake the knowledge of particular things, there will be time for us to treat of those aids which all tend to enable us to know how to use our senses and to perform experiments according to certain rules and in order and which suffice for determining the thing which is investigated, so that we may determine from them according to what laws of eternal things the thing was made, and that its inmost nature may be known to us, as I shall show in its place.[39]

Experimentation reveals the characteristics of the thing, which must thereafter be interpreted by such causes as will account for them. The causes will be many, not single, though the determined characteristics indicate a single nature, for an idea of the mind may be determined by numerous causes. Any hypothesis which accounts for the properties discovered in experimentation is true, and among hypotheses that one is to be chosen from which the properties are most readily deducible. Spinoza illustrated the explanation of natural phenomena by the example of the parabola: one curve is discovered, many causes may equally well account for it. Moreover the criticism he directed against the conclusions Boyle derived from his experimentation is determined by this

[39] *Int. Emend.;* II, 37.

view of experimentation; there are innumerable elements in even a simple and excellently controlled situation; they are not exhausted in experiment, nor is the essence of the thing uncovered, but properties are enumerated which can be accounted for by assigning causes. A double criticism of empiricism is suggested by this point of view, and Spinoza suggests alternately to Boyle, first, that his general hypotheses could always have been established on common experience as easily as on his careful experiment, and, second, that in any given case the contrary hypothesis too would account for the phenomenon. If Boyle experiments carefully to show that the taste, inflammability, and all the physical and chemical properties of nitre or spirit of nitre can be accounted for by supposing minute parts in motion, Spinoza insists that the hypothesis would have been legitimate even if no experiments had been conducted, for we have sufficient common examples of minute parts which are made to account for properties of wholes: the sound of boiling water, the steam of one's breath on a cold day, and many other instances. Behind this first criticism is, of course, Spinoza's doctrine that a cause may account for the properties of a thing (and therefore the hypothesis may be true) even if it can be shown that the thing was actually produced otherwise. If on the other hand Boyle suggests as hypothesis that nitre and spirit of nitre are composed of heterogeneous elements, Spinoza at once undertakes to show that all the properties which are accounted for by that theory are accounted for as well by the theory that the parts are homogeneous.

Such criticism does not indicate an antagonism toward experimentation and toward theory, but rather an estimation of what is contained in them. Hypotheses supply causes for properties revealed in experimentation; an hypothesis that succeeds in accounting for the properties is true. Hypotheses are illegitimate only when they are supposed to be exclusive descriptions of the nature of the thing described. By that last step they become fictions. Speaking of hypotheses which are formed to explain certain motions which agree with heavenly phenomena, Spinoza remarks[40] that, *if these are applied to celestial movements we conclude from them the nature of the heavens, which can nevertheless be quite*

[40] *Int. Emend.*; II, 22, note y.

different, especially since many other causes can be conceived to explain such motions. He refers to the same notion when he says earlier,[41] *See below what we say of hypotheses which are understood clearly by us; but the fiction consists in that we say that they exist in heavenly bodies.* Conceived properly there is no danger in what, if improperly conceived, is fiction. The principle by which an hypothesis operates is guarantee of the truth of the properties deduced from it, and is indication also of what that truth consists in.

Each separate approach to the method must therefore bring out in a different light the universal principles of natural things (as they are expounded in the *Ethics* or in the *Principles of Descartes's Philosophy*) on which as on causes all concepts depend. Each approach leads to principles, such as infinite thought, which follow from the absolute nature of some attribute of God and which must exist always and infinitely.[42] Dependent, however, on those principles are the principles of thought, which Spinoza expounds in his treatment of the mind, and the principles of bodies, which he seeks in Part III of the *Principles of Descartes' Philosophy.* The first expounded a psychology on metaphysical principles. The physical hypotheses of the latter would probably, together with the first most universal principles, have formed his own physics; he sought, he said, principles to explain the phenomena of heaven and earth, not principles which suffice only for the phenomena of heaven, such as astronomers seek at random. When demonstration is complete it starts from uncaused causes and from them proceeds by hypotheses to particular effects; the *Ethics* is an illustration of the true method, which proceeds by the standard of the true idea of God. By this mechanism and in this sense the deduction of the *Ethics* follows the sequence of the causation of ideas from God to the passions. The demonstrations of the *Ethics* either are improper or follow a new method. If there have been confusions in its interpretation, it is because the *Ethics* is in the geometric manner, and the geometric method has been interpreted in other ways than this; if the explanation of the method as a deduction from cause to effect has been overlooked it is because causation is usually interpreted in another, usually naturalistic and

[41] *Int. Emend.*; II, 19, note r.
[42] *Eth.* I, 21; II, 65.

temporal, sense. But in the writings of Spinoza there is sufficient material to reconstruct both the exposition and the illustration of a method which works a subtle and valuable philosophic development in the theory of deduction and experimentation. Doubtless the unfinished state of the *Improvement of the Understanding* is witness of difficulties which he recognized as unsolved, and there is no need therefore to insist that the analysis of method is final or even satisfactory. But the beginnings he made suggest investigations in directions other than those which the centuries since him have undertaken. At very least there are suggestions, in his writings, concerning metaphysical implications of the mathematical method which modern continuators in mathematical logic are little inclined to consider. It is not impossible that contemporary studies of methodology might be turned by such considerations to other problems. Until recently our science and logic engaged in the attempt to reduce all relations to external relations and all causes to efficient causes. Spinoza suggests that efficient causes, taken alone, explain nothing, but are themselves made intelligible by the essences of things. Metaphysical and logical difficulties are involved in that suggestion, and to them Spinoza's philosophy offers solutions. The need for a metaphysics and for a new method, which he felt, persists in contemporary logic and philosophy, and contemporary students might learn, from his approach to problems, well grounded though unwonted philosophic inquietudes.

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REVIEWS OF BOOKS.

Le problème de la sensation. Par MAURICE PRADINES. Paris, Société d' Édition Les Belles Lettres; New York, Oxford University Press; 1928. Pp. 280.

This work of Maurice Pradines is the first part of a philosophy of sensation. It is to be followed by two other parts dealing with the primary and the higher senses respectively. A preceding volume has dealt with the philosophy of action in general. The present instalment is practically an application of the philosophy of action to specific problems of psychology. The major part of the book is occupied with rather detailed criticism of psychological doctrines, but the object stated at the beginning is by nature philosophical: a true psychology must have for its basis a true philosophy, and the guiding principle of this book is the examination of current psychological theories in the light of a philosophical doctrine.

In conscious opposition to the present tendencies, M. Pradines adopts the standpoint of intellectualism. The word, however, need not create a prejudice in the mind of any ardent empiricist; the author is not an advocate of a vague spiritualism or an effete doctrine of innate ideas. Though clearly akin to Maine de Biran and Bergson, he follows an independent line; he considers that 'sense-phenomena' and 'immediate data' are equally false notions, because sensations are not objects which the intellect must reach across a gap between matter and mind; they are instruments which the intellect uses, and from the beginning they share the nature of intelligence. This is not an easy doctrine to grasp in its whole significance, and the author has realized the necessity of demonstrating it by an examination of the most fundamental terms and tenets of psychological theory. The analysis which he offers of these basic notions is subtle and thorough; it is not very easy reading and must necessarily suffer from the brevity of the account here given. The treatment is divided into three books, of which the first deals with quality, the second with space and external perception, the third with time and perceptive memory.

The problem of quality raises the question how much in the case of sensation is dependent on the psychic activity of the individual. The atomic sensation has already been discredited by psychologists from James to Külpe and the *Gestalt* school. But the error of that theory

survives in attenuated forms; we incline to think that a sensation has independent status and is 'given' with a fixed content. This content is (according to our author) really secondary and belongs to the act of the mind. Reduced to its true immediacy the sensation becomes 'protopathic' (the author having adopted Dr. Head's conclusions), and virtually a physiological process; above this level it is 'epicritic', which it can only be if it receives some addition from the subjective side. An obvious case is the affective element; pain (as Reid said) is not in the sword and is not strictly given. It is refreshing to see the old common-sense philosopher getting his due from the French! Berkeley, also, applied a similar analysis to sight and hearing, but there stopped. Wundt, who made every quality affective, is written off as a misfortune. Fechner is taken to have shown that intensity is not 'measured' but has only a constant correlation with its stimulus, being something which we contribute by our activity. M. Pradines rightly points out that Fechner is generally misread and misused in this connection. A significant point is made by drawing attention to the history of the relation between quality and quantity; the new physics of Galileo was based on the assumption that qualities were not in space or time, and therefore need not be considered in an objective mathematical science. From this standpoint all psychological data really become superfluous, being only "epiphenomena", as Huxley called them.

The question whether sensation represents objects or has any inherent meaning brings out a new phase. The author denies any representation in the ordinary sense, but modifies the denial by making the problem biological. Physical qualities or the materials of physics are abstracts; something must be added to them to restore the living reality. The empirical data show that we may be 'deaf' to uninteresting sounds; that the range of colours has increased with the progress of civilization and the practice of discrimination; that central factors play a distinctive part in vision, as proved by the work of Katz (p. 46). Finally we come to the doctrine of specific energies, which Mueller stated and regarded as supporting Kant's idealism. But if, as the doctrine asserts, the nerves so act that only a specific quality results (*e.g.*, light by simulation of the optic nerve) this must be due to the nature of the neural process. In other words the quality must be as objective as the process. Mueller's support of idealism was due to the persistence of the view that something could be added to the physiological process by association. But this cannot be accepted; the sensation must be mental from the first and can grow only by development, not by mechanical addition.

Here M. Pradines reaches a climax. Unless we have misunderstood the argument, the conclusion is that sensations, in respect of their meaning, are dependent on the individual's effort to clarify the object. The physiological event happens, but it is not actually in the picture. Impression is not representation; in the case of heat we can get impressions with no representation. Objectivity cannot be manufactured; it must be given in the process, and it is so given because sensation in real life is simply the process of objective expression. Clearly the next crucial problem will be to discover what we mean by space and externality.

The second book is concerned with the problem of space. It opens with the explicit statement that the aim in view is to restore the intellectual element. Quality has been defined as an operation of intellect; space, we are now told, is the object of intellect. As the eighteenth century (Berkeley and others) worked with association, so Bergson works with dissociation (an interesting antithesis!). Bergson begins with the vital core of reality, then dissociates the spatial world as 'abstract', the hypothetical field of mathematical physics. For him, space is a quality of objects; for M. Pradines it is objective quality (for all quality is objective) distinguished by its universality.

Berkeley rendered the great service of showing that vision does not itself give us space. The author argues that neither sight nor touch nor the two associated can achieve this result. The unsatisfactory state of the question is further shown by the existing conflict between nativistic and genetic theories. Nativism admits the main point, namely that space must be derived from some kind of activity. Mueller and Lotze are obvious cases; Wundt tried to escape by making association into a "creative synthesis". Other complex explanations are the "reflex nativism" of Piéron and others, the view of Hering that the eye has direction and depth, or the later view of Enjalran that external relation is a quality of conscious contents. From this medley of explanations we turn to the genetic theories. The main prop of this school is the process by which vision is first emptied of spatial content and then refilled by association with motor activity. The whole situation depends on the assumption that if space is not a native sense-datum it must be acquired. M. Pradines cuts the knot by denying the alternatives; all spatial construction is due to the growth of intellect. Here follows a very interesting discussion of Kant, Schopenhauer and Helmholtz. The author confesses that Kant's formalism repelled and misled him. But later he came to see that Kant was fundamentally right, for he saw that "sensation is sub-

jective so far as it comes from the object, objective so far as it comes from the subject". We leave this paradox to be digested by all good Kantians. It seems to mean that space is objective because it is the indispensable groundwork of all our directed activity, while it is equally subjective because it is determined by reference to the position of the individual (possibly the same as Mr. Russell's "public" and "private" spaces).

One important point is the decision that space cannot be a product of sequences. For that reason it is not legitimate to derive space from the series of positions in movement. Clearly the positions would be already in space or have a spatial quality, and therefore this view would beg the whole question. In Book III we come to time and memory, with the exciting thesis that "to perceive space is to know time". We are told that "time gives space a material, space gives time duration". We interpret this to mean that space as co-existence of objects becomes area or distance because it requires time to traverse it (where motion plays its part), while time (as simple flux of experiences) acquires definite sequence from the relation of parts of space. From place A to place B in a spatial whole becomes a definite distance by relation to the time required to pass through the experiences involved in moving from A to B. This is a subtle analysis, which seems to be justified. It is in harmony with the fact that space only becomes practically important when it demands motion, as when an object is out of reach; and also with the common view that space-relations vary with rate of motion, as when we say that steam or electricity has "annihilated space". But M. Pradines' main object is to show that all explanations of space tend, more or less, to defray their expenses at the cost of time. As the physicists have discovered that space and time are not practically separable, so M. Pradines has discovered that in theory they must be kept wholly distinct; there can be no flux of space.

The book concludes with a discussion of memory, defined as a confused residue of perception. Any lingering fears that the intellectualism of the program would develop into mysticism can hardly survive this definition. The subject is first treated in relation to the different senses (smell, taste, etc.); recognition of the present involves discrimination and a kind of auxiliary reference to a past. So far we must postulate a self with adequate continuity, but no 'pure' memory or real duration. Bergson is fully appreciated and highly praised, but here the paths diverge. Pawlow's organic conditioning and Piéron's cerebral acts are adduced as more likely to solve the

problems. We are here dealing only with perceptive memory, and the problem is to trace its organic connection with sensation, and then its gradual evolution. Images are taken to be only sensations impoverished by loss of their intensive and spatial qualities. Animals remain at the associative level, when the smell of the food directly signifies the utility of the object as edible. Human development consists in the growing capacity to isolate factors in the whole situation. Thus art and science arise from what are called disinterested attitudes, being more correctly new interests in the object and new processes of clarification. Hence man goes beyond the perceptual situation and intellect expands its world beyond immediate utility, achieving the new forms of relation which constitute science (*e.g.*, cause and effect) or art (the sphere of pure qualities). These 'pure states' are not, therefore, to be sought at the beginning of the process; they come as products of evolution in later stages. The kind of analysis given us by Hume and all the extreme empiricists is neatly shelved as relevant only to the animal mind.

The philosophy implicit in this work is intellectual realism. Though nowhere expressly called realism, it obviously favours the attitudes of Reid, Russell and Alexander, to quote only British parallels. Traditional idealism is rejected by implication, because subjectivity is taken to be artificial and the contact with objects is from the first events inherent in conscious activity. The word intellectual means that no gap is recognised between a class of sense-data as foreign material and a class of thought-processes as directed upon this material. Even the more recent schools of 'thought-psychology' are held to have erred in accepting the distinction, though they tried to emphasise the value of acts and attitudes. Empiricists find their problems most acute when they try to evaluate concepts; usually they feel compelled to degrade them. M. Pradines aims to abolish the original gap and, in this sense, to deal only with intellectual processes and their levels. The outcome, as we have tried to show, is very instructive, and the work is a contribution to philosophical criticism which no specialist in this field can afford to overlook.

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Formale und transzendentale Logik. By Edmund Husserl. (Jahrbuch für Philosophie und phänomenologische Forschung, Volume 10, pp. 1–298.) Halle (Saale), Max Niemeyer Verlag, 1929.

The subject of this essay is one which would seem to have concerned Husserl all through his long career as a thinker. The problem in-

volved is that of the relation of subjective and objective logic. The fundamental conception of logic which was worked out in the first volume of the *Logische Untersuchungen*, the *Prolegomena zur reinen Logik*, was that of logic as an objective science roughly identical with what we are in the habit of calling symbolic logic or, as Husserl prefers to call it, *mathesis universalis*. In defining this science emphasis was placed on the non-psychological character of logic. But the second volume of the *Logische Untersuchungen* did not proceed to unfold this science itself. Instead the author was drawn into a series of investigations which we should first be tempted to call psychological but which Husserl calls phenomenological. This consists of a series of very subtle analyses of the modes of pure consciousness involved in the awareness of various kinds of meanings, *i.e.* of the varieties of consciousness-of-objects. This introspective reflective analysis, carried on in complete abstraction from the supposed observational or experimental findings of psychology, would seem to have been Husserl's chief interest and indeed his chief contribution to philosophy from the beginning. It would be going too far to say that in the second volume of the *Logische Untersuchungen* he fell back into the psychologism which he repudiated in the first volume. Nevertheless the struggle between the objective or realistic interpretation of logic, which equates logic with mathematics, and the belief that logic can only be fully understood when related to the mind would seem to have been a determining factor in his whole intellectual development. The conception of a pure phenomenology was intended to define a science which would have the *a priori* character of pure logic and yet would reveal, in part of its scope, the structure of the experiences in which logical concepts and truths are given.

It is this dualism which results in the structure of the present essay, which is divided into two parts. The first deals with pure formal logic as *mathesis universalis;* while the second attempts to give a transcendental grounding of this same science and thus indirectly of science in general. As in the case of the *Prolegomena* and the *Ideen zu einer reinen Phänomenologie*, the author's purpose is to work out *a priori* the idea of a possible science. He elaborates a program for pure logic, but does not attempt to set forth the content of the science itself. His conception of pure logic appears to be approximately identical with that held by Mr. Russell. There is perhaps some significance in the fact that just as Mr. Russell was led on to an "analysis of mind" so Husserl is led to a parallel but diametrically opposite phenomenology of consciousness.

A fundamental conception for the present essay, and indeed for Husserl's thought in general, is that of "*Evidenz*". The term is used to indicate not the facts on which a conclusion is based but rather that mode of consciousness or presentation in which the object itself is directly and concretely present. The "evidence" in which the "irreal" objects are given is analogous to that in which the so-called real objects of sense-perception are given. The identity of these ideal objects can be directly seen and grasped in spite of the many different acts of perception. In somewhat the same way a single psychical experience can be grasped first as actually present and then in a succession of different modes of retention and reproduction. It is this identifiability which belongs to the essence of an object of experience in the broadest possible sense, and which is found whether the object is sensible (a material thing), irreal (a judgment), or mental (any experience). Now "evidence" is that mode of givenness or presentation in which the thing itself is present. This may be found in each of these three cases. It does not possess an absolute apodeictic quality which would guarantee us against all chance of error. It is nevertheless the case that an "evidence" can only be recognized as illusory when it comes in conflict with some stronger "evidence". Nevertheless, since evidence is that mode of intentionality in which the thing itself is given, it is the absolute standard of truth. Further the categories of objectivity and "evidence" are correlative; for every fundamental kind of objectivity there is a fundamental kind of experience, *i.e.*, of "evidence". Natural science must be based on external perception, for this is the one mode of consciousness in which the objects of natural science can be brought to direct givenness. It is an error to reject the testimony of sense-perception, for in spite of its liability to correction by further experiences it is the direct givenness of sensible things and must be the source of all judgments concerning them. From this we see that Husserl is, in his own way, an empiricist. He might also be called a perceptionist, for it is certain that he regards all knowledge as based on some sort of direct perception. The point to be noted here, however, is that he seeks to apply perceptionism to logic. Logic is primarily apophantic, theory of judgment. The transcendental phenomenology of judgments aims to bring out the ways in which a judgment can be present to consciousness. By judgment is meant not the judging but rather that which is judged, the ideal proposition. When we read or listen to someone speaking the judgment may be present in a vague or confined way. We do not explicitly judge ourselves. But we can render the judgment explicit or

distinct and be conscious of the identity between the confused judgment and the distinct. This vague or confused mode of consciousness is only a special case of "empty-consciousness", *i.e.* of unintuitive consciousness. It may be however that we are unable to render the judgment distinct, because on attempting to do so we become aware of a formal contradiction; in such a case the belief in the original judgment is, with an *a priori* necessity, set aside. When a judgment is set aside in this fashion the state of affairs judged need not itself come to intuitive clarity; the question is merely whether the judgment can be thought distinctly. This is not the case if it includes a formal contradiction. Now it is this act of explicit and distinct judging in which the judgment itself is given *originaliter* as an ideal objectivity. It is this kind of experience which is the basis of the pure logic of consistency. Husserl's theory of logic may be compared to Spinoza's view that we cannot *really* think an absurdity, or rather that while we can vaguely and abstractly think it we cannot concretely realize what we mean by it. Pure logic is thus founded on certain laws concerning what is concretely thinkable.

It is characteristic of Husserl's view that pure logic is both a formal apophantic and a formal ontology. In this connection his views may be compared with those of the new realists who declare that logic is the science not of thoughts but of things. Formal ontology, he says, is concerned with the empty 'something' and its transformations. In fact the difference between formal logic and formal ontology seems to be merely in the fact that ontology contains the application of the logical laws to truth and reality, neither of which need be mentioned in *mathesis universalis*. Pure formal mathematics is a doctrine of propositions as meanings in which their possibility as meanings is determined; that is, the possibility of their being distinctly understood. A thinkable meaning corresponds to every possible object, but pure mathematics says nothing about the possibility of objects as such. Thus in itself *mathesis universalis* is not quite formal ontology, but we need only make the application to the possibility of objects to transform one science into the other. In fact we are led to make this transformation if we regard *mathesis universalis* as *logic*, that is, in its application to science which deals with reality. It is the destiny of logic as the theory of science to be the science of the possible categorial forms in which objects can exist. Now the concept of a categorially formed objectivity is not a logical concept but an ontological one. It is the essence of such an objectivity to be the fulfilment of the meaning of a judgment. In the ideal case of perfect fulfilment the ob-

jectivities in their categorial forms are *given* in the strictest sense, and they are grasped in evidence as they are in themselves. Thus logic, the science of pure apophantic forms, is at the same time the science of the forms of concrete being. As knowing and judging we have no other objectivities than those that are categorially formed, and there is a mistake in the wish to have others. Thus there is no rational metaphysical problem about the applicability of logic, since no objects not in logical forms are in any sense possible. One is reminded of Kant's proposition that the conditions of the possibility of experience are at the same time the conditions of the possibility of the *objects* of experience.

While thus virtually identifying logic as *mathesis universalis* with ontology Husserl does not stop at this point. A realist of the type of the Russell of the *Principles of Mathematics*, or of the six authors of the *New Realism*, might follow him thus far, but he would surely repudiate the subjectivism of the second half of the essay. A development of Husserl's thought can be observed in this connection. The *Logische Untersuchungen*, with the *Prolegomena zur reinen Logik* in the foreground and the distinctions between the act, the content, and the object, tended to produce the impression that he was a realist, perhaps of the type we now call the "critical realistic". But the *Ideen* made it clear that he was really a transcendental idealist of the Kantian-Fichtean type. And in this new essay the tendency to a transcendental phenomenological idealism has full sway. In its application to logic this means that *mathesis universalis* remains a naively positivistic science unless completed by an analysis of the acts of consciousness which, as Husserl puts it, *constitute* its objects and its truths. Thus logic deals with the forms of judgment which are had in their own proper evidence on the basis of certain exemplary judgments. But these exemplary judgments are themselves ideal entities supposed to be capable of being given an indefinite number of times to the same or different judgers. Logic presupposes that each judgment has a single unchanging distinct meaning, and ignores the vagaries of actual thought. It is the business of the transcendental phenomenology of judgment to make clear the meaning of the act of thought by which we grasp a single identical judgment as something permanent and transcendent to the various acts of judging. As long as *mathesis universalis* proceeds blindly and naively with regard to this presupposition, it has not been justified. The meaning of such a presupposition can only be understood by an analysis of the experience in which a judgment is given as an ideal identity.

Husserl is thus led back to a consideration of the transcendental or subjective side of logic. He reviews the problem of an external world in Descartes, Hume and Kant. Descartes failed to grasp the transcendental meaning of the ego which he discovered. He also took for granted the principles of logic in a naive dogmatic way. His position is comparable, says Husserl, to the *Scheinklarheiten* of contemporary realism, which in connection with a naively isolated logic endeavors to prove to the scientist that he can dispense with all epistemology. Hume, Husserl values very highly. There is of course the fundamental difference between phenomenalism and phenomenology. All that phenomenalism regards as fictions, as products of the mind's tendency to feign, phenomenology regards as ideal objects of mind; and the acts of consciousness in which they are given are to be studied without that condemnation as illusory which was characteristic of Hume's mode of thought. Hume's greatness lies in the fact that he was the first to grasp the universal problem of transcendental philosophy, namely, that of the consciousness of objects of all kinds. He was the first to free the soul from all connection with 'reality', and to treat it merely as a field of impressions and ideas. He nevertheless failed to notice the universal characteristic of consciousness as such, intentionality, and was unable to give a solution to the universal problem which he discovered. Kant failed to grasp the problem of transcendental phenomenology in its full scope, taking for granted the validity of analytic judgments. This is a deficiency which he shared with Hume, who failed to give any account of the truths which express "relations between ideas". In spite of the severe criticism to which Husserl subjects the doctrines of Descartes, Hume, and Kant, it is obvious that he is at one with them in the fundamental importance which he attaches to the subjective.

The novelty of his present position is nowhere more manifest than in his doctrine of truth and evidence. He explicitly repudiates the doctrine of truth-in-itself which he originally took over from Bolzano and which he defended so vigorously in the *Logische Untersuchungen*. "Alles objektive Sein, alle Wahrheit hat ihren Seins- und Erkenntnisgrund in der transzendentale Subjektivität" (p. 242). The theory of an absolute truth, he says, stands in the way of any true understanding of "evidence". It is thought that there *must* be some apprehension of absolute truth in absolute evidence. This absolute evidence is conceived as a character of certain experiences by which it is guaranteed that we are apprehending absolute truth. But truth is a regulative idea, a goal which we must strive to reach rather than anything

that we can be sure that we possess. Truth is relative to its horizon, and the truth of the market-place has its truth, which is not destroyed by the truth of science. In a word, truth is relative to the experience, the "evidence" in which it is grasped. What is first taken to be a clearly apprehended truth may be set aside by a later insight which again has the character of "evidence". Nevertheless experience, "evidence", reveals *being* itself, imperfectly when the experience is imperfect, more nearly perfectly when the experience is more nearly perfect. In perception the thing itself is perceived, and if perceptions are deceptive that is because they are in conflict with later perceptions which show with certainty what is real in place of the illusory objects. Nevertheless, it is the act of perceiving which is fundamental rather than its ideal and identical object. The thing is there because we perceive it, rather than that we perceive it because it is there.

Thus logic receives its transcendental grounding in an introspective-reflective analysis of the modes of pure consciousness, of that Subject which is the correlate and presupposition of all being and all truth. And this transcendental subjectivity remains *das einzige absolut Seiende*. Here it would seem that we strike rock-bottom. But of course there can be no guarantee that in a new insight the transcendental ego itself may not disappear. Thus it appears that Protagoras has the last word rather than Plato, or perhaps we should say that Hume and Kant have finally won out over Leibniz and Bolzano. Perhaps the most valuable contribution of phenomenology will be found in the end to be the conception of experience in all its modes as intentional, as directed on objects, and of philosophy as an analysis of the intentionality implicit in each mode of experience. Such an analysis seems more promising, at least, than the Humean-Russellian analysis into sensible particulars. Even if we hesitate before accepting the relativity of truth, we can learn from the phenomenological analysis of cognition.

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The Works of Aristotle translated into English, Vol. I. Edited by W. D. Ross. Oxford, at the Clarendon Press, 1928. Unpaged.

With this volume, which contains the whole of the logical works, the Oxford translation of Aristotle is complete except for the *De Anima* and the *Physics*. The latter, translated by the late R. K. Gaye and by R. P. Hardie, will probably have appeared before this review is published. The former, translated by J. A. Smith, is expected to

appear during 1930. The translation of the *Metaphysics* was reviewed in this journal in March, 1910, that of the *De Mirabilibus Auscultationibus* in September, 1911, and those of the *De Caelo* and the *De Generatione et Corruptione* in November, 1924. The translation does not include the fragments, but it is possible that the editor may translate them in a supplementary volume. With the exception of them and of the two treatises soon to appear, the whole of the extant works of Aristotle is now available in English for the first time (if we omit the version of Thomas Taylor, which is said to be utterly worthless). This is an achievement of very great importance. It has become common to philosophise without a knowledge of Greek, especially in this country; but a knowledge of Aristotle is necessary to the historical understanding of all subsequent western philosophy (except perhaps the Hellenistic), and no philosophy is really understood if it is not understood historically, so that this translation may be said to make it possible for the first time for an English-speaking person to philosophise without knowing Greek. Previous to its appearance several of Aristotle's works had apparently never been done into English at all (except for Taylor's rendering); this seems to be true even of such outstanding works as the *Physics*.

The present volume is important because of the intimate place that the Aristotelian logic has held in all medieval and modern thought. Every educated person has imbibed something of it, many of its technical terms have become familiar to everyone, and more or less distorted versions of it are still taught to thousands of people yearly. It is of first-class interest to see the source of this deeply-rooted element in our thought, and that has hitherto been impossible within the limits of the English language.

When Edward Poste brought out his translation of the *Posterior Analytics* in 1850 he entertained the following ideas about its importance: "There is a pretty general agreement among those who have devoted any attention to Logic, that the Logical works of Aristotle would repay the labour of a perusal. In spite, however, of this opinion, it does not appear that the pages of the Organon are often turned over by very diligent hands. Nor is this very difficult to be accounted for, if we consider their obscurity—a quality, indeed, which they share with most of Aristotle's productions. It was to facilitate the study of the original that this translation of a portion of it was undertaken: and the Posterior Analytics was the portion selected, both because it is intrinsically the most valuable, as affording the greatest insight into Aristotle's views, and bringing him on to the same ground with modern

writers on the Philosophy of Science; and because the remaining parts are already tolerably well known through the works of the Scholastic logicians, while this, though far more interesting to a student of the Baconian Logic, has been comparatively neglected."

It was perhaps hardly right to say that the parts other than the *Posterior Analytics* are tolerably well known through the works of the scholastic logicians. The tradition has so cut and dried Aristotle's logic that it gives an inaccurate picture of the inconsistencies and omissions of the original; the classification of judgments under the heads of quantity, quality, relation, and modality goes back no further than Kant, and who nowadays is aware of the way in which Aristotle discussed the *Categories* unless he has read the treatise itself? Poste's translation does not seem to have had any effect on the philosophy of science, such as he perhaps anticipated; and I venture to think, contrary to the opinion of some, that this translation will not do so either. The questions that modern science suggests seem to be of a kind that the *Posterior Analytics* does not help us to answer. It offers a view as to what the form of a completed science should be, but it does not throw much light on induction or on the status of scientific categories. Its present-day importance seems to be epistemological; it is perhaps the best exposition of the view that is opposed to what Aristotle called circular demonstration and we call the coherence-theory of truth. Its power in this respect may be inferred from the fact that Mr. G. R. G. Mure, its translator in the present volume, who does not hold Aristotle's view, finds himself enticed out of the province of a translator into that of a commentator, and says that "it is questionable how far Aristotle's logical system can survive" the damaging admissions of chapter 22 of the first book. It is undoubtedly the most important part of the *Organon* for us.

The importance of the other logical works lies not in any contribution they can make to our present problems, but in the light they throw on our development and on that of Aristotle. Persons who do not read Greek will now be able to some extent to judge for themselves whether they can accept, for example, the views lately put forward by Friedrich Solmsen in his *Die Entwicklung der aristotelischen Logik und Rhetorik*.

The translation is excellent. The highest standards of scholarship, accuracy, and style, are maintained throughout. Above all there stand out the translations of the *Posterior Analytics* by Mr. G. R. G. Mure, and of the *Prior Analytics* by the late Mr. A. J. Jenkinson. Mr. Mure is admirably readable and fluent, which is a remarkable achievement

considering the difficulty of the Greek; so far as I can analyse his art, he appears to obtain this effect by using the common philosophical language of to-day; this procedure might seem to invite the danger either of vagueness or of making Aristotle seem more technical than he is, but Mr. Mure avoids both. He has also used expansion to a considerable extent. There are many things in the *Posterior Analytics* that no one can be certain about; and hence some people will disagree with some of his interpretations, feeling that Aristotle's doctrine has been approximated too closely to British Hegelianism, as in the translation of λόγον by "a power of systematizing them" in 100a2. But this does not alter the excellence of his work. In footnotes he gives helpful explanations of some of the more difficult passages.

Mr. Jenkinson, using another method, achieves an even greater success. His translation of the *Prior Analytics* is perfectly simple and unpretentious. He always uses the least pompous word available, and thus he reproduces much of the admirable naiveté of Aristotle's style, which Mr. Mure, employing our modern diction, inevitably misses.

Against these two performances the translations of the *Categories* and *De Interpretatione* by Miss E. M. Edghill, and of the *Topics* and *De Sophisticis Elenchis* by Mr. W. A. Pickard-Cambridge, do not appear so good as they would do elsewhere. Mr. Pickard-Cambridge had a very difficult task, for a work so intimately bound up with the Greek language as the *De Sophisticis Elenchis* does not lend itself to close translation; and he has occasionally given a strange frigidity to his rendering by the use of unfamiliar phrases, such as "take a look along at the inflections", and especially by the use of the subjunctive in indirect questions and in other places where its presence is foreign to the spirit of modern English. For example, he writes "See whether the term fail to be used". So far as I can see, he does not carry this usage through consistently, for in another place he writes "See also if the genus fails to be synonymous with its species". These are, however, only minor points in a thoroughly scholarly translation.

Miss Edghill's translation tends to be a little more formal than the Greek. She fills out the original to a considerable extent—in 18a36 τι becomes "an event of a given character"—and sometimes uses a long word instead of a short one; but these, again, are small points in an excellent piece of work.

The first part of the volume, down to the end of the *Posterior Analytics*, appeared in 1926, the whole in 1928. There are separate

indices for the two parts. There is no pagination but Bekker's. Correction is made of the error by which in Bekker pages 153–168 are numbered 149–164.

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Æsthetic Judgment. By D. W. PRALL. New York, Thomas Y. Crowell Company, 1929. Pp. xviii, 378.

To offer with some degree of adequacy and system a survey of the field of æsthetics, is the aim declared by Professor Prall in the preface of this book, and successfully achieved by him. He has written an able and careful work, evidencing close acquaintance with the technique of various fields of art, sharp insight into and critical reflection upon the problems of æsthetic theory, and unusually sensitive and catholic appreciation of æsthetic values.

Professor Prall begins his study with an account of the æsthetic experience, the essence of which he regards as consisting in disinterested, absorbed attention to determinate qualities. It is disinterested in that, unlike practical activity, it is its own justfication. It is an experience of qualities, *i.e.* not of events or existents as such, but of the sensuous appearances, the "æsthetic surface", of things. And it is always and essentially an experience of qualities as absolutely specific, determinate, individual,—never just as cases of some kind or other. In such experience, the beauty of the æsthetic surface 'strikes' us,—it is felt by us with a shock. It is shocks of this sort that we record in æsthetic judgments. The typical æsthetic judgment is, 'this is beautiful', but in many cases we use some more determinate, less solemn, term than beautiful, *e.g.* fine, capital, jolly, charming, etc. The experience of beauty consists in the delightful apprehension of the æsthetic surface of an object in direct intuition. It involves a transaction between an object and a percipient, and depends therefore in part upon the constitution or condition of the individual percipient at the time; hence the commonness of disagreement between the æesthetic judgments of different persons.

The principal æsthetic materials are sounds, colors, lines and shapes. They owe their superior importance to the fact that each of them is capable of entering into elaborate order-relations based upon a character intrinsic and peculiar to the given material. That character in the case of sounds is pitch; in that of colors, hue; and in that of lines and shapes, dimension. With other sensory qualities, *e.g.* tastes and smells, it is otherwise. There is in them no natural order analogous

to that of hues and pitches. They cannot therefore be 'composed' by man in works of art according to the principles of order that he understands, but only by Nature, in the 'unprincipled' way in which they occur there. They must be included in the inventory of æsthetic materials, for they fulfill the conditions necessary for æsthetic experience, but they are only elementary æsthetic materials.

There are principles of structure in art, other than those intrinsic to a given sort of material. One of the chief of these external principles of structure is rhythm, which essentially consists in regular recurrence in time. Professor Prall insists that the concept of rhythm is not applicable to space literally, but only in so far as the parts of lines or figures are apprehended in temporal sequence. Rhythm as such is always a matter of time-order and time-division, never merely accent or duration. The latter are only means of sensuous emphasis by which attention may be summoned for the purpose of establishing a rhythm.

The pleasure we find in works of art is often not primarily æsthetic at all, for "æsthetic pleasure is always pleasure in an object immediately present to a sense" (p. 182), whereas in the appreciation of a work of art other matters enter. One of them is the fitness of the object to the human wants and purposes which it was created to serve. This is a factor in the evaluation of the products not only of the crafts but also (in varying degrees) of the fine arts. Poetry and painting, for instance, have not only an æsthetic surface, but also a function, *viz.* representation. Another factor in the evaluation of works of art is their technique. Technique—the methods, materials, and processes, through which the products of the various arts are created—defines the nature of the various arts and determines the sorts of beauties that they can create; and their technique is at the same time embodied in, preserved by, and made manifest by, the products of the art. A third and perhaps the most important factor of the value that works of art have consists in the feelings, emotions, and desires of which they are made expressive. Inasmuch as the sensuous surface of the objects is all that is ever directly present to intuition, these other factors of beauty enter only so far as they become apparent upon that surface as specific sensuous or structural modifications of it. This forces us to distinguish two senses of the term "æsthetic surface", one, the "thinner" and more literal, already defined in terms of direct sensuous intuition; and another and "thicker" sense, according to which the other factors of beauty mentioned are regarded as also characteristic of the surface, but that surface is then said to have more or less of a "depth", constituted by those factors.

Expression is characterized by Professor Prall as the giving of "outward sensuous and formal specification to meanings, characters, qualities, and significant activities" (p. 304). Expression is the aim of all the fine arts; and the possibilities of each of them in the accomplishment of it are determined by its own peculiar medium and technique. Natural beauty, however, is also expressive, if not, like that of art, in the sense of being the product of an attempt to express, at least in the sense that, for the beholder, it has significance as if it were such a product.

Responsible æsthetic criticism begins in direct appreciation as recorded in æsthetic judgment. Criticism has a variety of aspects. There is first the evaluating of beauties according to standards. The only applicable standards are the degrees of beauty in various respects, previously experienced in works of art of like kinds. In another of its aspects, criticism consists in an analysis of works of art which discriminates their æsthetic constituents and reveals the mode of their integration. In so far as criticism thus is able to point out how a specific beauty is achieved, it constitutes an explanation of it in terms of the technique of the particular art. Another of the tasks of the critic is that of attempting "to make the blind see and the deaf hear". This he may do by exhortation or command or bullying, or, better, by translating into words to some extent the given work of art. That is, a verbal description of its beauties, although perforce always more or less inadequate, may effectively guide to them the attention of those whom he addresses. Lastly, the critic may, by expressing in language his own feelings of delight in a given work of art, produce vicariously in others by sheer contagion some of the enjoyment that is appropriate to that work of art; and thus stimulate their latent capacities for first-hand appreciation of it. As for the relation of æsthetic appreciation to life, it may be said that all value is literally æsthetic so far as it is fully and genuinely and strictly value at all, and not merely means to value. Moreover, unless we cultivate the accurate discrimination of details of quality upon which the æsthetic experience arises, we remain in ignorance of all the marks upon the surface of the world, from which alone can be inferred the practical import of it, which concerns us so greatly.

Among other points which seem of especial merit to the present reviewer, may be mentioned Professor Prall's insistence throughout on the absolute specificity, the uniqueness, of each object of æsthetic attention; his contention that although it is of objects that beauty is properly asserted, the perception of beauty involves a transaction be-

tween the object and an observer, and that beauty is therefore dependent upon and relative to the observer; his admission of tastes, odors, etc., to the status of genuine æsthetic materials; and his able defense of representation as a proper and important element in painting.

There are also some matters of which criticisms might be offered. One is the only perfunctory acknowledgment that the æsthetic experience may be an experience of ugliness instead of beauty. Professor Prall's almost exclusive attention to the beauty side of it, is what leads him to use the term "a beauty" instead of "an object of æsthetic experience". This in turn leads him to assume or suggest constantly the existence of norms of beauty and the possibility of authoritative judgments in matters of beauty; for obviously, if an object is labelled "a beauty" to begin with, observers of it will be "competent", or "trustworthy", or "have a formed taste", in proportion as they experience beauty in it. But the question really is always whether the given object *is* "a beauty", and according to Professor Prall's own explicit teaching, the answer to that is always a matter of the individual observer's actual delight in the contemplation of the object. Professor Prall, by this teaching, is committed to the complete relativity of beauty; yet he would hold on at the same time to the possibility of "superiorly valid" judgments of beauty. In the last chapter, after dwelling on the relativity of æsthetic judgments to many highly variable factors, and on the fact that difference in æsthetic judgments is therefore not the exception but the rule, he says: "But none of this makes accurate æsthetic theory arbitrary or non-objective; it only makes it difficult" (p. 364). But this is true only if by "æsthetic theory" is meant something strictly non-normative, and consisting of purely empirical descriptions of the psychology of various persons or classes of persons.

Another difficulty has to do with Professor Prall's concept of "æsthetic surface". He defines it in terms of *sensuous* intuition, but later, by speaking of that surface as having "depth", he makes it include much that is not sensed but *signified*. His justification of this is that the things thus signified appear upon the sensuous surface. But obviously they appear not *upon* it but *through* it. The surface is, to use his own term, "transparent"; and what is perceived through a surface cannot consistently be described as being itself that surface. In other words, to allow "depth" to a surface is to take away the very essence of surface. The only way in which all the factors of beauty can be done justice to, and yet æsthetic surface kept (as it truly is)

infinitely thin, would seem to be the defining of æsthetic surface not in terms of *sensuous* intuition, but of intuition, of immediacy, in general,—whether sensuous, imaginal, or conceptual.

Again, Professor Prall's discussion of Expression is made less helpful than it should be, by the too indeterminate meaning which he assigns to the word. In view of the confusion caused in present-day æsthetic discussions by the very different senses in which that term is employed by various writers (for instance Santayana and Croce), this was the place of all others where some precisely formulated definition of terms consistently adhered to throughout was needed, rather than a characterization of the meaning of Expression forced to remain vague by its attempt to include so many different things at once.

One more point to which objection might be raised is Professor Prall's view that in ultimate analysis all value is really æsthetic. This is to identify æsthetic value and immediate value,—a proposal which would require one, at the cost of abusing language, to call the pleasure of drinking water when extremely thirsty, æsthetic. That proposal moreover puts in question the sufficiency of Professor Prall's characterization of the æsthetically contemplative attitude as "the apprehension of objects upon which full attention is focussed, so that they are the complete content of consciousness at the time" (p. 368). It may be well to ask whether it is not rather the nature of the interest that one has in the content of such rapt attention, which is the essential thing,—is what differentiates, for instance, tea-tasting as detective work from tea-sipping as æsthetic experience, both of which equally demand full discriminative attention to the sensuous content.

Although Professor Prall's book is clearly written throughout, it must be said that some passages are made somewhat laborious reading owing to the occurrence in them of unnecessarily long and involved sentences. At least one of twenty-one lines occurs, and many of ten, twelve, and more. To say all this, however, is but to "praise the book with faint damns".

Some of the most interesting material in it is to be found in the detailed analyses of the several arts and in the many discussions of examples introduced to support various contentions. But of this no adequate idea can be given in a review.

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The Use of Philosophy. By John H. Muirhead. Cambridge, Harvard University Press, 1929. Pp. 208.

In a series of concise and elegantly written lectures, intended for the general public, Dr. Muirhead gives the idealistic account of the

nature and function of philosophy, dealing with the topics: "What is Philosophy, Anyway?" (II), "The Spirit of Man" (IV), "Social Life" (V), "Religion" (VI), "The Life of Knowledge" (VII), and "Philosophy and Politics" (VIII).

The first lecture, "Why Everybody Needs a Philosophy", seems to be an abridged form of the second, and was "given over KGO, at the General Electric Station in Oakland". Lecture X deplores the absence of "Discussion in America", while Lecture III examines "The Place of Philosophy in American Universities", and speaks of a "stage of decadence" through which "what might be called 'great philosophy' is passing" (p. 44). Dr. Muirhead urges that the philosopher should be also a man of vision, since "metaphysics not less than poetry is a kind of vision", and "speaks from a deeper level of experience than ordinary common-sense or the special sciences" (p. 48).

Lecture IX, "The New Alignment of the British Commonwealth of Nations", is included in a volume on philosophy because "the constitution of an empire has a fascination for the philosopher. For in it what by general admission is the main problem of metaphysical philosophy—the union of the One and the Many—takes a peculiarly human form, none other than that of the possibility of uniting complete freedom and independence of the members with the unity and subordination of particularist ends" (p. 151). But the last two addresses, "The Scot Abroad" (XI) and "On the Anniversary of Sir Walter Scott's Birthday" (XII), have no obvious ground for inclusion but that they are from the same pen and were delivered, like the others, in California. Their inclusion serves, however, to illustrate the fact that the 'great philosophy' is universal in its interests, and that the more truly philosophic a philosopher is, the more frequently he will escape from that narrowing range of problems which the declaration of independence of the special sciences would leave to philosophy.

It is the lectures first listed, however, which give the book its chief value and interest. But I can touch only on a few points which may serve to indicate Dr. Muirhead's general position.

As against Mr. Russell's appeal for the liberation of philosophy from ethics, since "ethical metaphysics is . . . an attempt . . . to give legislative force to our wishes" (quoted, p. 32), Dr. Muirhead asks how, on this basis, logic itself is to be rescued from "that most fundamental of all human interests, the distinction between truth and untruth". He argues "that these ultimate values, of which good and evil may be taken as a type, are just the field in which philosophy has its most

important work to do" (p. 33). In similar vein he argues against the mechanistic view of life which regards mind merely as "an instrument for manipulating" the forces of a mechanical world for the sake of enjoyment. "Is it [not] possible", he asks, "to claim for the human mind quite another nature and function as legislator and controller of this gigantic machine for quite other ends?" (p. 56). These ends, beauty, goodness, justice, he regards as a new dimension,—beauty, for example, being "seen not *by* the eye but *through* the eye" (p. 61). And it is mind's "third-dimensional capacity, . . . and not merely the possession of superior intelligence in working out the lower pattern that marks man out from the other animals" (p. 62; also pp. 73 ff.).

This "sense of belonging to a larger life, to a Whole, ultimately to *the* Whole", Dr. Muirhead takes "to be a part of all life from the lowest to the highest" (p. 100), as exemplified in reproduction, in which animals "go beyond themselves" (p. 96). In human life this sense of belonging to the Whole constitutes the root of religion (p. 100). The "apparent endlessness and consequent *un*satisfyingness" of the intellectual quest (p. 101) has thus its complement in the "power of the spirit . . . to see the whole in the part" (p. 102) and to "'live in the present' [just] *because* it is eternity" (p. 108).

But Dr. Muirhead's Whole is no mystic other-world divorced from this, for, as Professor Wilde has finely said, "The road to the celestial city . . . starts at our feet, and must be travelled one step at a time" (quoted, pp. 148 ff.). "If philosophy can teach us this: (1) that, while the civic community is not everything, and there is a community that goes beyond all States and nations, perhaps a Being of which all communities of men are only one partial embodiment, it is yet the creation of the spirit, called into existence by the spirit, and sustained in existence to serve ever more fully the ends of spirit; and (2) that in view of this service there are few things, perhaps nothing, which concern us more closely and about which it is more worth while concerning ourselves than its wellbeing—philosophy will be earning well both of the republic of learning and the Great Republic which is the State" (p. 149).

L. P. CHAMBERS.

WASHINGTON UNIVERSITY.

A Sceptical Examination of Contemporary British Philosophy. By ADRIAN COATES. London, Brentano's Ltd., 1929. Pp. 256.

The title of this volume is not quite exact. In it only a part of contemporary British philosophy is subjected to a critical examination, the

part namely represented in the personal statements which make up the content of *Contemporary British Philosophy: Second Series.* And even within these rather narrow limits the survey is not complete, Messrs. Bax and Hoernlé being omitted from it. The author's aim is both critical and constructive. He makes use of these personal statements as a convenient point of departure for launching an attack against doctrines and methods with which he does not agree and in the place of which he would set up certain views of his own.

On its constructive side Mr. Coates' discussion is in support of what he calls "common sense pluralism", for which he thinks he can claim (in principle) the major arguments of Ward and Moore. Ward's monadism he takes over, rejecting the theistic reading of it (for no clearly stated reason) and expanding it to include the thesis that monads are both spiritual and corporeal—not merely spiritual, as Ward is apparently supposed to have held. Mr. Moore's philosophy of common sense he would modify only by pushing it further in order to provide for it a logical foundation. And this foundation he thinks he finds in the two following propositions, both of which are accepted as logically fundamental: (a) "The first and most important thing I know, the basis of all my ideas of existence, is the fact of my own existence"; and (b) "Whatever I think of or assert, including my own existence, is conditioned by and involves the fact of my thinking". These two propositions are held to give a pluralism, because my own existence involves the existence of other individuals and things; to give a realism, because along with my existence the existence of the 'other' is given as independent; and to give a 'relative' realism, that is, a realism which does not ignore the fact that reality is 'self'-centered or personal—a fact which is involved in the second foundational proposition and which is reconciled with experience by the consideration that 'our' thinking is secondary (not prior, as Descartes had supposed) to 'our' existence. Taken separately, the first proposition "gives us the world of experience as other"; the second give us "the world of experience as known". Together, they underlie a commonsense pluralism.

Throughout much of his discussion Mr. Coates denounces what he calls idealism, and he is quite vigorous in his denunciation. This is rather puzzling in the face of his own statement of the implications of his view. For this view, we are informed, involves the conclusion that all our ideas of reality must derive from the consciousness of our own existence and, therefore, our idea of an existent must be of an individual—individuality being "the essence of my own idea of

myself as existing"—, that "it is impossible to discuss reality impersonally". Reality, thus, is relative; reality "as a system or unity is 'someone's reality'", the 'self' is "focal to reality". In one sense it is true that a dispute about the definition of a term is largely useless. But if Ward and McTaggart, for example, are not to be classed as idealists, one has a good right, it would seem, to ask on what grounds they are excluded. Truth to say, Mr. Coates seems to be constantly assuming that idealists with one accord deny any sort of reality to corporeal things—note, for instance, his statement to the effect that "the essence of idealism is to take, instead of 'the self and the external world', 'mind' or 'self-consciousness' *alone* as the 'ultimate fact'" (author's italics). On this assumption however, unless I am greatly mistaken, it would be quite difficult to find any examples of idealists among thinkers of importance. One cannot fail to recall that one of the earliest representatives of British idealism, J. F. Ferrier, bottomed his whole system on the proposition that the atomic fact of knowledge is subject-object in inseparable relation, that either in isolation is "the contradictory". Nor has the later tradition, so far at least as my knowledge of it extends, seriously wavered on this point.

Three other matters in this discussion are very important, and they deserve extended consideration. Limitations of space, however, make impossible here anything more than a bald statement of them with a brief comment on each. They are the theses: (*a*) "that the subject-object relation belongs only to the category of fact, and that the category of value is autonomous"; (*b*) that all meaning is either *poetical* or *logical*, and there is a basal difference between the two; and (*c*) "that we cannot get anywhere by trying to analyse an isolated and abstracted 'act of perception': we must take our experience as a whole as the concrete fact which is to be analysed". The first thesis I seriously question, despite the author's very illuminating argument in support of it. The second thesis must, I think, be accepted as in principle sound, provided the disjunction is not converted into a basal dichotomy such as I seem to find at the bottom of the first. To the third thesis I wholly subscribe, with the suggestion that a serious acceptance of it might prevent much discussion of the epistemological problem which can hardly be other than fruitless.

An evaluation of Mr. Coates' criticisms of the several philosophers whom he considers cannot here be entered upon. One can say generally, however, that his criticisms are directly and vigorously expressed; and, while some of them are uncompromising, all are illuminating and provocative. Viewed from this angle, his discussion is a

valuable commentary to this particular cross-section of contemporary British philosophy.

G. Watts Cunningham.

Cornell University.

Englishmen, Frenchmen, Spaniards: an Essay in Comparative Psychology. By Salvador de Madariaga. With a Prefatory Note by Alfred Zimmern. Oxford, Oxford University Press, 1929. Pp. 256.

A poetic and philosophic mind here essays to pluck out the heart of the mystery of national character; and emerges with three untranslatable characteristics for the nations considered: for England, *fair play;* for France, *le droit;* for Spain, *el honor.* Answering to these are action, thought, and passion. An ingenious inquiry is sustained into the mode of each of these in its own element and in the other two. All this interpretation is treated hypothetically, so as to be empirically verified or refuted in the second part of the book.

There, by appealing to the structure of the three communities, their conceptions of leadership, their languages, their emotional forms, etc., the author is enabled to verify his hypothesis that "there is such a thing as national character", and to believe that three great nationalities have yielded to the light the garments of their inner temperaments. It all seems too good to be true, until by a moment's reflection the reader discovers the invisible hand that pre-established the harmony thus revealed. Señor Salvador de Madariaga has by long residence come to know England and France hardly less intimately than his own native Spain. Out of their observed leadership, their spoken languages, their felt philosophies of love, etc., he has arrived at certain conclusions regarding the genius of each. He takes these conclusions as hypotheses, and finds assurance of discernment in their fitting so admirably the facts observed.

The methodological legerdemain does not, however, lessen admiration for the results. Perhaps nowhere else will one find a better rationalization and articulation of what essentially common sense holds a Spaniard, a Frenchman, an Englishman to be. Whether it be a true picture, the reviewer knows not. Would that he did! For if it be a false one, millions of men harbor illusions about themselves and about millions of others. If it be a true one, common sense is validated wholesale; and we know with what we must contend in accommodating others to ourselves or ourselves to others in our faltering gestures at an international community. The reviewer knows but

this of all he would he knew: that, whether true or false, this book contains more words, and beautiful words, put together to make sense, and finely put together too, than he believed it possible to say in such a key upon such a subject.

In spite of the innocent methodological pretense, the book makes no false claim. It is, admittedly, "no 'scientific' work, based on statistics, comparative study of sources and 'facts'". Quite to the contrary, "it is obvious", says the author, "that an essay of this kind must be based on first-hand knowledge and intuition". Whether rationalized prejudice, or sanely articulated discernment, we have here a work of art to be approached as literature and to be prized for what it is. Not unaware of the high practical significance and perplexity that attend such diversity as he here sketches and sharpens—the book was originally delivered as lectures at the Geneva School of International Studies—, the author, nevertheless, in a 'Spanish' mood of natural piety leaves echoing at the end this æsthetic chord: "The admirable variety of national characters is one of the manifestations of the wealth of Creation, and, as such, men owe it to the Creator to respect it as a manifestation and to themselves to enjoy it as a spectacle and a gift".

T. V. Smith.
University of Chicago.

The following books were received during January and February:

The Philosophical Bases of Education. By Robert R. Rusk. London, University of London Press, Ltd., 1928. Pp. 206.

Types of Philosophy. By William Ernest Hocking. New York, Charles Scribner's Sons, 1929. Pp. xvi, 462.

The Psychological Approach to Reality. By Francis Aveling. London, University of London Press, Ltd., 1929. Pp. xii, 252.

Mind and the World-Order. Outline of a theory of knowledge. By Clarence Irving Lewis. New York, Charles Scribner's Sons, 1929. Pp. xvi, 446.

The Encyclopædia of the Social Sciences. Volume I: Aaronson-Allegiance. Edited by Edwin R. A. Seligman and Alvin Johnson. New York, The Macmillan Company, 1930. Pp. xxviii, 646.

Foundations of Geometry and Induction. By Jean Nicod. Translated by Philip Paul Wiener. With prefaces by Bertrand Russell and André Lalande. New York, Harcourt, Brace, and Company, 1930. Pp. 286.

Mahatma Gandhi's Ideas. Including selections from his writings. By C. F. Andrews. New York, The Macmillan Company, 1930. Pp. 382.

The Searching Mind of Greece. By John M. Warbeke. New York, F. S. Crofts & Co., 1930. Pp. xii, 464.

The Significance of Personality. By RICHARD M. VAUGHAN. New York, The Macmillan Company, 1930. Pp. xii, 302.

The Book of Diogenes Laertius. Its Spirit and its Method. By RICHARD HOPE. New York, Columbia University Press, 1930. Pp. xiv, 242.

The Living Mind. Essays on the significance of consciousness. By WARNER FITE. New York, Lincoln MacVeagh, The Dial Press, 1930. Pp. x, 318.

Romance of the Machine. By MICHAEL PUPIN. New York, Charles Scribner's Sons, 1930. Pp. 112.

Philosophy of Value. An essay in constructive criticism. By LEO RICHARD WARD. New York, The Macmillan Company, 1930. Pp. x, 264.

Sefer Ha-'Ikkarim, Book of Principles. By JOSEPH ALBO. Critically edited on the basis of manuscripts and old editions, and provided with a translation and notes, by ISAAC HUSIK. Volume three. Philadelphia, The Jewish Publication Society of America, 1930. Pp. 351; one page to an opening.

Immanuel Kant's Critique of Pure Reason. Translated by NORMAN KEMP SMITH. London, Macmillan and Co., Ltd., 1929. Pp. xiv, 682.

Theophrastus: Metaphysics. With translation, commentary, and introduction by W. D. Ross and F. H. FOBES. Oxford, at the Clarendon Press, 1929. Pp. xxxii, 88.

Un chapitre peu connu de la vie d'Henri de Saint-Simon. Son rôle dans les négociations de Lille. Par HAROLD A. LARRABEE. Traduit par M. PERRON. Paris, Imprimerie de la Cour d'Appel, 1929. Pp. 24.

Le système d'Alexander. Exposé critique d'une théorie néo-réaliste du changement. Par PHILIPPE DEVAUX. Paris, J. Vrin, 1929. Pp. 196.

Zur Logik des konkreten Begriffs. Von ERNST MANHEIM. Munich, C. H. Beck'sche Verlagsbuchhandlung, 1930. Pp. xii, 158.

Der Begriff der Seele in der Ethik des Plotin. Von PAUL OSKAR KRISTELLER. Tübingen, J. C. B. Mohr (Paul Siebeck), 1929. Pp. viii, 110.

Die Religion in ihrer dogmatischen und ihrer reinen Form. Versuch einer Grundlegung der Religionsphilosophie. Von LEO HAMBURGER. Munich, Ernst Reinhardt, 1930. Pp. 170.

Am Ende der Philosophie. Ein kritisches Wort an die Zeit und ihre Philosophen. Von LUDWIG FREUND. Munich, Ernst Reinhardt, 1930. Pp. 180.

L'Idealismo italiano e i suoi critici. By UGO SPIRITO. Florence, Felice Le Monnier, 1930. Pp. 268.

Atti del VII congresso nazionale di filosofia. Rome, 26–29 May, 1929. Milan, Casa Editrice d'Arte Bestetti & Tumminelli, 1929. Pp. 406.

La pedagogia di Raffaello Lambruschini. By MARIO CASOTTI. Milan, Società Editrice 'Vita e Pensiero', no date. Pp. xii, 264.

Il Significato storico di Leibniz. By FRANCESCO OLGIATI. Milan, Società Editrice 'Vita e Pensiero', no date. Pp. 252.

NOTES.

Dr. Mary Whiton Calkins, professor of philosophy and psychology at Wellesley College, died on February 26th, at Newton, Mass. Her writings covered a wide range of psychological and philosophical subjects and were in the main a development of Royce's monistic and personalistic idealism. The writings by which she is best known are *Persistent Problems of Philosophy* (1907), *A First Book in Psychology* (1909), and *The Good Man and the Good* (1918). For nearly forty years she was one of the most influential members of the faculty of Wellesley College. She had the unique distinction of being the first woman to be elected president of the American Psychological Association and the only woman who has ever been president of the American Philosophical Association. She was elected an honorary member of the British Psychological Association in 1928. In 1892, with the assistance of Edmund Clark Sanford, she established the laboratory of psychology at Wellesley, one of the first laboratories of psychology organized in this country and the first to be set up in any women's college. On her retirement last June from the faculty of Wellesley College, the Trustees voted her the unusual title of "Research Professor".

The Executive Committee of the Pacific Division of the American Philosophical Association on March 22, 1930, adopted the following resolution:

"The members of the Executive Committee of the Pacific Division of the American Philosophical Association wish to express on behalf of the Division and for themselves their grief over the loss American Philosophy has suffered through the untimely death of Mary Whiton Calkins. An erudite scholar, a skilful teacher, an incisive thinker, a noble woman, Miss Calkins served the cause of disinterested knowledge with genuine devotion. In criticism she was always patient and fair, of incomparable courtesy, willing to learn from the views of others, no matter how opposed to her own. Steadfast in her positive convictions, she presented the truth as she saw it, in writings as rigorous in method as they were forceful in style. To these intellectual gifts she united a capacity for friendship truly great. In California, where she spent several seasons, her many friends mourn her death and treasure her memory.

"For the Executive Committee,

"J. LOEWENBERG, *President*,
H. D. ROELOFS, *Secretary*."

Dr. Christine Ladd-Franklin died at her home, 417 Riverside Drive, New York City, on March 5, at the age of eighty-two. From 1904 to 1909 she was lecturer in psychology and logic at Johns Hopkins University, and from 1910 lecturer in the same subjects at Columbia University. She was widely and favorably known for her contributions to the psychology of color and for her theory of the antilogism in logic.

The Earl of Balfour died at Woking, Surrey, England, on March 19. He was president of the British Academy and of the British Institute of Philosophical Studies. Among his works were "A Defence of Philosophic Doubt" and "The Foundations of Belief".

Dr. Harold R. Chidsey, Associate Professor of philosophy at Brown University, has resigned to accept a professorship at Lafayette College, where he will direct the department of philosophy.

Dr. Ralph M. Blake, Professor of philosophy at the University of Washington, has accepted an appointment as Professor of philosophy at Brown University.

By a gift of the late Edgar Pierce, Ph.D., Harvard 1895, and author of "The Philosophy of Character", a Lectureship in honor of William James has been established in Harvard University. Dr. Pierce was at one time Instructor in Psychology at Harvard, and later a member of the Visiting Committee for the Department of Philosophy and Psychology. Appointments will be made to this Lectureship at least biennially, the appointees being in residence at the University and participating in the regular instruction. Professor John Dewey will be the first lecturer on this foundation. During the spring term beginning February 1931, he will deliver a series of ten public addresses on a topic not yet announced. The subjects covered in the William-James Lectures are not limited in any way, beyond the general condition that they must fall within the field of philosophy and psychology. The lectures will appear in book form.

The Philosophical Review has received a copy of the first volume of the *Encyclopædia of the Social Sciences*, issued under the supervision of Edwin R. A. Seligman, Editor-in-Chief, and Alvin Johnson, Associate Editor, with the coöperation of a large number of editorial consultants and a board of advisory editors composed of twenty-eight American and European scholars. In addition to the articles (Aaronson-Allegiance), this volume contains a Preface by the Editor-in-Chief summarising the history, scope, methods and aims of the Encyclopædia, and a lengthy Introduction (the joint product of the editorial staff and twenty-four individual authors) divided into two Parts as follows: Part I, The Development of Social Thought and Institutions (225 pages); Part II, The Social Sciences as Disciplines (118 pages). The publishers have taken pains with the format of the volume. It is of quarto size, durably bound, printed in double columns and in clear type on good paper, and furnished with fairly generous

margins. Those responsible for the volume are to be heartily congratulated on the success of their achievement. The REVIEW welcomes it as a substantial contribution to, and product of, contemporary scholarship.

The following is a list of articles in current philosophical periodicals:

MIND, XXXIX, 153: *Reginald Jackson*, Locke's Version of the Doctrine of Representative Perception; *D. W. Gotshalk*, McTaggart on Time; *Michael B. Foster*, The Contradiction of "Appearance and Reality"; *J. E. Boodin*, Cosmology in Plato's Thought (II); *H. M. MacDonald*, The Modern Theory of Relativity.

JOURNAL OF PHILOSOPHICAL STUDIES, V, 17; *J. C. Nunns*, The Meaning of Class Distinctions; *John S. Mackenzie*, Our Present Outlook in Speculative Philosophy; *H. H. Price*, The Appeal to Common Sense (I); *T. E. Jessop*, The Metaphysics of Plato; *Helen Wodehouse*, Social Machinery and the Social Spirit; *Kali Prasad*, Vedānta Solution of the Problem of Evil; *G. B. Brown*, The Progress of Physical Science; *Leonard Russell*, Science and Abstraction.

THE MONIST, XL, 1: *J. E. Turner*, Relativity without Paradox; *Herman Noack*, Recent Interpretations of Religion in German-speaking Countries; *H. R. MacCallum*, Emotion and Pattern in Æsthetic Experience; *Helen Knight*, Æsthetic Experience in Pictorial Art; *William Gruen*, Science and Tragedy; *Homer H. Dubs*, The Nature of Rigorous Demonstration; *F. P. Hoskyn*, The Relation of Malebranche and Leibniz on Questions in Cartesian Physics; *Albert G. A. Balz*, Where Ignorance is Bliss; *Helen M. Smith*, Sensations and the Constancy Hypothesis.

THE JOURNAL OF PHILOSOPHY, XXVII, 2: *Everett W. Hall*, Of What Use are Whitehead's Eternal Objects? 3: *Charles M. Perry*, Essences Sublimated; *Israel Knox*, Tolstoy's Esthetic Definition of Art; *Harold A. Larrabee*, Report of the Twenty-ninth Meeting of the Eastern and Western Divisions of the American Philosophical Association. 4: *L. E. Akeley*, Methodology in Physics and Psychology with Philosophic Implications (I); *Y. H. Krikorian*, The Meaning of Purpose.

THE HIBBERT JOURNAL, XXVIII, 2: *W. R. Matthews*, The Destiny of the Soul; *F. M. Cornford*, The Division of the Soul; *Sir Francis Younghusband*, The Faith of the Future; *W. J. Blyton*, Is Religion to be Specialised?; *C. G. Montefiore*, Jewish Conceptions of Christianity; *F. C. Burkitt*, What Christians Think of Jews; *Leonard Darwin*, Darwinism: A Reply to the Bishop of Exeter; *Baron von Oppell*, The Reality of Beauty; *Robert Swann*, Beauty and the Machine; *Charles Gardner*, Frederick Denison Maurice (1805–1872); *T. A. Lacey*, The Place of Authority in Religion; *G. Wilson Knight*, Macbeth and the Nature of Evil; *Sidney Spencer*, Religion, Morality and the "Sacred".

THE NEW SCHOLASTICISM, IV, 1: *Artur Landgraf*, Some Unknown Writings of the Early Scholastic Period; *E. von Rycken Wilson*, Empty (?) Space; *Francis Augustine Walsh*, A Recent Study of the Universal; *Daniel Charles O'Grady*, A Few Notes on the Metaphysics of Matter.

THE JOURNAL OF RELIGION, X, 1: *Shailer Mathews*, Doctrines as Social Patterns; *Julius A. Bewer*, The Christian Minister and the Old Testament; *Daniel Evans*, "Through All to God"; *George Lawton*, Spiritualism—A Contemporary American Religion; *Shirley Jackson Case*, Popular Competitors of Early Christianity; *N. W. Lund*, The Presence of Chiasmus in the New Testament; *Ernest F. Scott*, The Supernatural in Early Christianity; *Carl Clemen*, Missionary Activity in the Non-Christian Religions.

THE AUSTRALASIAN JOURNAL OF PSYCHOLOGY AND PHILOSOPHY, VII, 4: *E. Morris Miller*, The Beginnings of Philosophy in Australia and the Work of Henry Laurie (I); *W. M. Kyle*, British Ethical Theories, The Importance of Bishop Butler; *W. Macmahon Ball*, The Rights of the Individual; *A. C. Fox*, An Examination of Realism; *Francis Lions*, Odour; *T. Jasper*, The Destroying Angel; *John Anderson*, Theory and Practice in Morals.

THE BRITISH JOURNAL OF PSYCHOLOGY (GENERAL SECTION), XX, 3: *William McDougall*, Second Report on a Lamarckian Experiment; *Robert H. Thouless*, The Technique of Experimentation on the Psycho-Galvanic Reflex Phenomenon and the Phenomenon of Tarchenoff (I); *H. R. De Silva* and *S. H. Bartley*, Summation and Subtraction of Brightness in Binocular Perception; *S. Wyatt*, Maximum Capacity and Average Achievement; *W. H. Winch*, Christian and Jewish Children in East-End Elementary Schools; *J. B. Russell*, The Measurement of Intelligence in a Rural Area.

JOURNAL OF EXPERIMENTAL PSYCHOLOGY, XIII, 1: *W. H. Mikesell* and *Madison Bentley*, Configuration and Brightness Contrast; *John G. Jenkins*, Perceptual Determinants in Plane Designs; *Theodora Mead Abel*, Attitudes and the Galvanic Skin Reflex; *M. Howell Lewis*, Elemental Versus Configural Response in the Chick; *St. Clair A. Switzer*, Backward Conditioning of the Lid Reflex; *Roland C. Travis* and *Raymond Dodge*, Ocular Pursuit of Objects which Temporarily Disappear.

THE AMERICAN JOURNAL OF PSYCHOLOGY, XLII, 1: *J. F. Humes*, The Effect of Practice upon the Upper Limen for Tonal Discrimination; *P. T. Young*, Studies in Affective Psychology; *H. G. Bishop*, On Mayer's "Residual Sonorous Sensation"; *F. H. Lund*, Physical Asymmetries and Disorientation; *C. E. Ferree*, *G. Rand*, and *M. M. Monroe*, A Study of the Factors which cause Individual Differences in the Size of the Form-Field; *S. C. Ferrall* and *K. M. Dallenbach*, The Analysis of Burning Heat; *G. W. Williams*, A Comparative Study of Voluntary and Hypnotic Catalepsy; *M. A. Tinker*, *D. Roberts*, and *H. Jackson*, Definite and Indefinite Preparation in the Visual Apprehension Experiment; *D. G. Paterson* and *M. A.*

Tinker, Time-Limit *vs.* Work-Limit Methods; *W. M. Kellogg*, An Improved Automatograph; *C. A. Ruckmick*, A New Electrode for the Hathaway Galvanic Reflex Apparatus; *D. P. Boder*, A Tridimensional Maze; *A. Walton*, Demonstrational and Experimental Devices.

PSYCHOLOGICAL BULLETIN, XXVII, 1: (General Reviews and Summaries) *H. M. Johnson* and *T. H. Swan*, Sleep; *H. E.* and *M. C. Jones*, Genetic Studies of Emotions.

REVUE DE MÉTAPHYSIQUE ET DE MORALE, XXXVI, 4: *L. de Broglie*, Déterminisme et Causalité dans le physique contemporaine; *V. Delbos*, La préparation de la Philosophie moderne.—Caractères généraux de la Philosophie moderne; *J. Wilbois*, La notion philosophique de cause dans le Monde social.

REVUE PHILOSOPHIQUE, LV, 1 & 2: *L. Lapicque*, L'orientation actuelle de la physique; *É. Mayer*, La psychologie militaire; *E. Leroux*, La philosophie morale en France depuis la guerre; *Ch. Pérez*, Quelques aspects de la biologie; *H. Wallon*, La psychologie appliquée.

BULLETIN DE LA SOCIÉTÉ FRANÇAISE DE PHILOSOPHIE, XXIX, 3: *Pierre Janet*, Les sentiments régulations de l'action.

ARCHIVES DE PSYCHOLOGIE, XXII, 85: *William Dérias*, Deux types d'intelligence; *Marguerite Loosli-Usteri*, Le test de Borschach appliqué à différents groupes d'enfants de 10–13 ans; *Ed. Claparède*, IX^me^ Congrès international de Psychologie.

SCHOLASTIK, V, 1: *Peter Browe*, Die Kinderkommunion im Mittelalter; *Franz Pelster*, Literargeschichtliches zur Pariser theologischen Schule aus den Jahren 1230 bis 1256; *Michael Gierens*, Gottesbeweise aus den übernaturlichen Werken Gottes und ihre Bedeutung und Eigenart im Ganzen unserer Gotteserkenntnis; *Heinrich Lennerz*, Kann die Vernunft die Möglichkeit der beseligenden Anschauung Gottes beweisen?

RIVISTA DI FILOSOFIA, XXI, 1: *P. Martinetti*, Sul valore obbiettivo della filosofia; *G. Grasselli*, Tubinga nel presente e nelle sue memorie; *L. Fossati*, Conoscenza e volontà nel Suarez; *R. Rinaldi*, Le contraddizioni della Dialettica; *P. Treves*, La teoria della legge in Tommaso Campanella.

GIORNALE CRITICO DELLA FILOSOFIA ITALIANA, X, 6: *Bernardino Varisco*, L'apologetica; *Dante Severgnini*, L'estetica in Plotino; *Giuseppe Gabrieli*, Intorno a Nicola Stelliola filosofo e linceo napoletano; *Fausto Nicolini*, Sulla biografia di G. B. Vico; *Eugenio di Carlo*, Lettere inedite di P. Galluppi a V. Cousin.